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– M.F. Duretto

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**Systematics of *Boronia* section *Valvatae sensu lato* (Rutaceae)**

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*Abstract*

*Boronia* Sm. sect. *Valvatae* (Benth.) Engl. is revised and an infrageneric classification is presented. Four species, *B. alata* Sm., *B. algida* F. Muell., *B. corynophylla* Paul G. Wilson and *B. edwardsii* Benth. are removed from *Boronia* sect. *Valvatae* and two sections, *Alatae* Duretto (monotypic) and *Algidae* Duretto, are newly described to accommodate them. Within *Boronia* sect. *Valvatae s. str.*, four subsections, nine series and five subseries are described, including the following new ones: *Boronia* sect. *Valvatae* subsect. *Bowmaniae* Duretto; *Boronia* sect. *Valvatae* subsect. *Grandisepalae* Duretto; *Boronia* sect. *Valvatae* subsect. *Grandisepalae* ser. *Quadrilatae* Duretto; *Boronia* sect. *Valvatae* subsect. *Grandisepalae* ser. *Grandisepalae* subser. *Verecundae* Duretto; *Boronia* sect. *Valvatae* subsect. *Grandisepalae* ser. *Lanuginosae* Duretto, *Boronia* sect. *Valvatae* subsect. *Grandisepalae* ser. *Lanuginosae* subser. *Jucundae* Duretto; *Boronia* sect. *Valvatae* subsect. *Grandisepalae* ser. *Lanuginosae* subser. *Filicifoliae* Duretto; *Boronia* sect. *Valvatae* subsect. *Ternatae* Duretto; *Boronia* sect. *Valvatae* subsect. *Ternatae* ser. *Ericifoliae* Duretto; *Boronia* sect. *Valvatae* subsect. *Valvatae* ser. *Erianthae* Duretto; *Boronia* sect. *Valvatae* subsect. *Valvatae* ser. *Fraseriae* Duretto; *Boronia* sect. *Valvatae* subsect. *Valvatae* ser. *Rupicolae* Duretto. Two new species, *Boronia anomala* Duretto and *Boronia angustisepala* Duretto are proposed, the later to accommodate the species that has erroneously been called *B. rubiginosa* this century. Two new varieties, *Boronia ternata* var. *promiscua* Duretto and *Boronia ternata* var. *austrofoliosa* Duretto, are also described. Within series *Valvatae* four species groups are recognised. Descriptions and nomenclatural notes are provided for all 63 species, two subspecies and six varieties. Keys to all taxa treated herein are given.

**Introduction**

James Edward Smith (1798, p. 288) described *Boronia* Sm. (Rutaceae, Boronieae) together with several species that had come to his attention through Australian collections and plants in cultivation in English hothouses. *Boronia* currently includes c. 140 recognised species and is widespread in non-arid Australia. Boronias are usually found on soils derived from siliceous sands, sandstones or granites, but are also occasionally found on limestones and metamorphics. *Boronia* is a common component of sclerophyllous heath communities, but is also found in wet and dry sclerophyll forests and woodlands, rainforest edges, swamps, soaks, foreshore and alpine communities.

The centre of diversity of *Boronia* is in the south-western botanical province of Western Australia (c. 50 endemic species). Other minor centres of diversity include the western edge of the Arnhem Land plateau, Northern Territory (see Duretto and Ladiges 1997), and south-eastern Queensland to central New South Wales. All species from northern Western Australia and the Northern Territory, and the majority of species from north Queensland, are included in *Boronia* sect. *Valvatae* (Benth.) Engl., while the majority of

species from southern Australia are placed in either *Boronia* sect. *Boronia* or *Boronia* sect. *Cyanothamnus* (Lindl.) F. Muell.

*Boronia* is not found in New Caledonia (see Guillaumin 1911; Hartley 1985, 1995). Weston *et al.* (1984) presented cladograms that showed that *Boronia* was paraphyletic with respect to *Boronella* Baill. (a New Caledonian genus). The position of *Boronella* is unresolved as no other genera were included in this analysis and the assumption that the presence of foliar sclereids was a synapomorphy for the two genera has been shown to be incorrect (Weston *et al.* 1984). Hartley (1995) suggested that *Boronella* is probably more closely related to *Myrtopsis* Engl., *Euodia* J. R. & G. Forster, *Brombya* F. Muell., and *Medicosma* J.D. Hook. than it is to *Boronia*. A dataset for a larger phylogenetic analysis of *Boronia* and its relatives, including genera such as *Boronella*, *Medicosma*, *Neobyrsesia* J. A. Armst., *Zieria* Sm. etc, is currently being compiled by the author.

The first infrageneric classification of *Boronia* was proposed by Benth (1863) and included seven series. Engler (1896, 1931) divided the genus into four sections, one of which contained five series. Since Engler (1896, 1931) only Wilson (1971, 1998), Weston (1990) and Hartley (1995) have attempted any revision. The need for a critical examination of *Boronia* and related genera has been expressed by several workers (Smith-White 1954; Weston *et al.* 1984; Hartley 1985; Stace and Armstrong 1992; Stace and Leach 1994). Currently in *Boronia* the sections *Boronia*, *Cyanothamnus*, *Imbricatae* Engl. (monotypic) and *Valvatae s. lato* are accepted (Wilson 1998).

### ***Boronia* sect. *Valvatae s. lato***

*Boronia* ser. *Valvatae* Benth. when first described by Benth (1863) included 17 species and four varieties. With reservations, Benth placed *B. inconspicua* Benth. in *Boronia* ser. *Valvatae* and noted that this species was possibly closer to some members of *Boronia* ser. *Pinnatae* Benth. than to members of *Boronia* ser. *Valvatae*: it is now placed in *Boronia* sect. *Cyanothamnus*. Engler (1896) raised *Boronia* ser. *Valvatae* to sectional status and incorporated all other taxa described since Benth's work. Sixty-three species are included in this treatment of *Boronia* sect. *Valvatae*.

To date, no taxonomy of *Boronia* included infrasectional classification within *Boronia* sect. *Valvatae* and only some taxonomic revision has been completed since Benth (1863) and Engler (1896, 1931). Weston *et al.* (1984) used several informal groups in their cladistic analysis, and the characters shared by the members of one of these groups, the '*B. ledifolia* group', was summarised by Weston (1990). This *B. ledifolia* group was shown to be polyphyletic by Duretto and Ladiges (1999).

Duretto (1995) and Duretto and Ladiges (1999) presented cladistic analyses of all known species of *Boronia* sect. *Valvatae s. lat.* On the basis of these analyses, they argued that *B. alata*, *B. algida* and *B. edwardsii* should be removed from *Boronia* sect. *Valvatae* and placed into two new sections, and that *Boronia* sect. *Valvatae s. str.* be divided into the four subsections and nine series described here. *Boronia* ser. *Grandisepalae* Duretto and *Lanuginosae* Duretto are further divided into two and three subseries respectively, and a number of informal species groups have been identified in *Boronia* ser. *Valvatae*. The classification of *Boronia* sect. *Valvatae s. lat.* is outlined in Table 1.

### **Materials and Methods**

**Material:** Herbarium specimens were made available from AD, BRI, CANB, CBG, DNA, HO, JCT, MBA, MEL, MELU, NE, NSW, OSS (Office of the Supervisory Scientist Jabiru, NT), PERTH, QRS, TCD and WAU. Cibachromes of specimens at K, colour transparencies of specimens at BM and CGE, and photographs of specimens at W, LINN

and LIV have been seen. Herbarium abbreviations, except OSS, follow Holmgren *et al.* 1990. These specimens were augmented with material collected in the field from 1992 to 1994. Where possible, at least five plants per local site were sampled. A complete list of specimens seen are available from the author on request.

**Anatomy and Scanning Electron Microscopy:** The central portion of the leaves of all taxa was sectioned transversely. Material was fixed in 70% ethanol. If fresh material was not available, herbarium samples were re-hydrated in water with a small amount of detergent, brought to the brink of boiling, left simmering for one hour and soaked over night before fixing in 70% ethanol. All fixed material was then placed in 70% ethanol overnight, dehydrated through a graded ethanol series up to 100% ethanol, infiltrated with 100% LR-White (London Resin) through a resin/ethanol series, and polymerised at 60°C. Sections 2 µm in thickness were cut on a Reichert Ultracut ultra-microtome, stained with 0.05% toluidine blue solution (pH 4.4) and observed and photographed using an Olympus BHS compound microscope. Voucher specimens for leaf anatomy are listed in Appendix 1.

Trichomes (of leaves, petals and stems) and seed surfaces of all taxa (where material was available) were surveyed using a Scanning Electron Microscope. Dry leaves, petals, stems and seeds were mounted on stubs using double sided or carbon tape with conductive carbon paint, coated with gold using an Edwards Sputter Coater S150B and examined and photographed at 5KV using a JEOL 840 Scanning Electron Microscope equipped with a lanthanum hexaboride filament. All photographs of seeds were taken of central areas on a lateral side, except where otherwise stated.

**Taxon Descriptions:** Descriptive terminology follows Theobald *et al.* (1979) and Hewson (1988) for hairs; Amelunxen *et al.* (1967), Wilkinson (1979) and Barthlott *et al.* (1998) for epicuticular waxes; Briggs and Johnson (1979) and Weston (1990) for inflorescence structure; and, Murley (1951), Powell and Armstrong (1980) and Barthlott (1984) for seed surfaces. The various degrees of hair density are defined as: a sparse indumentum is where the hairs are widely spaced; a moderately dense indumentum is where the hairs are spaced so that the rays do not overlap or overlap at the tips only, and the epidermis is clearly visible; and a dense indumentum is where the rays of different hairs overlap and the epidermis is not or barely visible. Conservation or ROTAP codes follow format of Briggs and Leigh (1996) for all taxa.

## Systematics

**Boronia** Sm., *Tracts nat. hist.*, 288 (1798). *Sp. lectotypica* (Wilson 1998): *B. pinnata* Sm.

*Cyanothamnus* Lindl., *Sketch veg. Swan. R.*, 18 (1839). *Sp. lectotypica* (Wilson 1998): *C. ramosus* Lindl. [= *B. ramosa* (Lindl.) Benth.]

*Shrubs or rarely small trees or herbs*, unarmed. *Leaves* opposite decussate or rarely subopposite or whorled or spiral, simple or imparipinnate, or bipinnate; palisade mesophyll usually tightly packed, non-secretory glands scattered in mesophyll. *Flowers* bisexual, four-merous, rarely five-merous (*B. scabra* Lindl. var. *attenuata* Paul G. Wilson), actinomorphic. Sepals free. Petals free. Stamens 8, rarely 10, the antesealous stamens sometimes sterile. Carpels ± free, lacking sterile apex; styles fused; two ovules per carpel, usually only one reaching maturity. *Fruit* of 1–4 cocci; cocci not transversely ridged, with rounded apices; endocarp consisting of two parts that often separate when the seed ejected from mature fruit: an elastic cartilaginous portion (the elastic endocarp)



that ejects the seed, and a membranous or thick and fleshy portion that may or may not remain attached to the seed (the placental endocarp) (cf. Wilson 1970, 1998). **Australia** c. 140 spp., all endemic, all states. References: Smith (1798); Bentham (1863); Engler (1896, 1931); Smith-White (1954); Wilson (1971, 1988); Rao and Bhattacharya (1978, 1981); Weston *et al.* (1984); Weston (1990); Hartley (1995).

Named to honour Francesco (Francis) Borone (1769-1794), a young Italian naturalist who helped Smith while he travelled through Europe in 1787 (Smith 1798).

*Boronia* sect's *Alatae*, *Algidae* and *Valvatae* differ from all other sections of *Boronia* by having petals that are both valvate in bud and persistent (except for *B. edwardsii* in *Boronia* sect. *Algidae* and *B. anomala* in *Boronia* sect. *Valvatae*) when the fruit is mature.

To retain the information in the consensus cladogram presented by Duretto and Ladiges (1999) all taxa, infrageneric and specific, are listed in phyletic sequence (see Nelson 1972, 1973; Forcy 1992). *Boronia* subsect. *Valvatae* is the exception due to the poorly supported structure of this clade (see discussion in Duretto and Ladiges, 1999).

### Key to sections, subsections, series and subseries of *Boronia* sect. *Valvatae* s. lato.

1. Inflorescence terminal, sometimes also in upper leaf axils; sepals imbricate or opposite-decussate in bud; stellate hairs absent; seeds dull.
  2. Leaves imparipinnate or bipinnate; inflorescence a large many-flowered panicle, peduncle large; seasonal growth unit not pseudodichotomous (coastal SW WA; monotypic - see **1. *Boronia alata***).....**sect. 1. *Alatae***
  2. Leaves imparipinnate or simple; inflorescence cymose 1(–3)-flowered, peduncle absent; seasonal growth unit pseudodichotomous (ACT, NSW, Vic., SA, inland SW WA).....**sect. 2. *Algidae***
1. Inflorescence axillary; sepals valvate in bud; stellate hairs present, if only on flowers or rarely absent (*B. anomala*); seeds shiny, rarely dull.....**Valvatae** s. str.
  3. Leaves pinnate; leaflets linear, involute, 1 mm wide; petals deciduous.....**5. *B. anomala* (subsect. *insertae sedis*)**
  3. Leaves simple or pinnate; leaflet shape variable, plane to revolute, usually 1 mm wide; petals persistent.
    4. Leaves trifoliolate, sometimes simple, with scattered wax platelets on surface; seeds reniform, dull (SW WA).....**subsect. 1. *Ternatae***
    5. Leaflets elliptic to oblanceolate, concolourous, plane.....**ser. 1. *Ternatae***
    5. Leaflets linear-elliptic, discolourous, margins revolute.....**ser. 2. *Ericifoliae***
  4. Leaves unifoliolate or imparipinnate, wax platelets absent or rarely forming a dense covering on surface; seeds elliptical with adaxial (micropylar) side flattened, shiny or rarely dull, if seeds dull then leaves plane and discolourous or glabrous and glaucous, or with 5 or more leaflets (N WA, NT, Qld, NSW, Vic.).
    6. Sepals equal to (in length and width) or larger than petals; filaments distinctly clavate, narrowing suddenly at apex so as to appear truncated before attaching to anther; antepetalous anthers much larger than antesealous; seed usually with prominent ridge on adaxial (micropylar) side, if without then seeds dull and leaves glabrous and glaucous; inflorescence 1(–3)-flowered (WA, NT, NW Qld).....**subsect. 4. *Grandisepalae***
    7. Plants, other than flowers, glabrous, glaucous; stems, at least when young, purple and distinctly quadrangular; seeds dull and without ridge on adaxial (micropylar) side; leaves simple.....**ser. 1. *Quadrilatae***
    7. Plants with a stellate indumentum, not glaucous; stems purple to brown, terete to slightly quadrangular; seeds shiny, with prominent ridge on adaxial (micropylar) side; leaves simple or pinnate.



8. Leaves simple; sepals much larger than petals; seed uniformly coloured (NT).....**ser. 2. Grandisepalae**
9. Stellate hairs on prominent stalks (to 1 mm long), rays 0.5–1 mm long; adaxial surface of sepals glabrous or glabrescent; fruits glabrous.....**subser. 1. Verecundae**
9. Stellate hairs without stalks, or stalks minute, rays minute or to 0.5 mm long; adaxial surface of sepals densely hirsute; fruits hirsute.....**subser. 2. Grandisepalae**
8. Leaves pinnate, or if simple then sepals equal to petals and seeds mottled (Kimberley, NT, NW Qld)..... **ser. 3. Lanuginosae**
10. Leaves simple, trifoliolate, or with 15–55 leaflets, leaflets or leaves elliptic, lanceolate or rhombic; leaves and branches glabrescent or with a sparse to moderately dense stellate indumentum; seeds mottled (Kimberley).....**subser. 3. Filicifoliae**
10. Leaves with 3–27 leaflets, leaflets linear; sparsely to densely hirsute throughout; seeds concolourous, rarely mottled but then leaves trifoliolate (Kimberley, NT, NW Qld).
11. Leaves petiolate; leaflets linear-elliptic to elliptic, strongly recurved to revolute, the midrib raised prominently on the abaxial surface; plant with a sparse simple/stellate to dense stellate indumentum.....**subser. 1. Lanuginosae**
11. Leaves sessile; leaflets linear-elliptic, plane or slightly recurved along margins, the midrib not raised prominently on the abaxial surface; plant with a glabrous or with a sparse simple/stellate indumentum.....**subser. 2. Jucundae**
6. Sepals much smaller than petals, if as long then much narrower; filaments tapering at apex; anthers isometric after anthesis; seed without prominent ridge on adaxial (micropylar) side; inflorescence 1-many-flowered (NT, Qld., NSW, Vic.).
12. Midribs of petals and leaves not raised on the abaxial surface; rays of stellate hairs fused, especially on petals (N Qld).....**subsect. 2. Bowmaniae**
12. Midribs of petals raised on the abaxial surface; rays of stellate hairs distinct (NT, Qld, NSW, Vic.).....**subsect. 3. Valvatae**
13. Leaves slightly discolourous, glabrous or with a sparse indumentum, rays of hairs to 0.5 mm long; simple leaves never sessile.
14. Pendulous shrub growing on vertical cliff faces, petals less than 3 mm long (NT).....**ser. 3. Rupicolae**
14. Erect shrub, petals greater than 3 mm long (Qld, NSW).
15. Abaxial surface of leaves or leaflets without prominently raised midribs, leaflets narrowly elliptic, elliptic or oblanceolate.....**ser. 1. Erianthae**
15. Abaxial surface of leaves or leaflets with prominently raised midrib, leaflets broadly elliptic-lanceolate.....**ser. 2. Fraseriae**
13. Leaves strongly discolourous with a dense indumentum on the abaxial surface, or with a moderately dense indumentum of hairs with rays to 1 mm long; if leaves simple then sessile.
16. Pendulous shrubs growing on vertical cliff faces; petals less than 3 mm long; leaves or leaflets plane, the midrib not raised prominently on the abaxial surface (NT).....**ser. 3. Rupicolae**
16. Erect or rarely pendulous shrubs; petals greater than 3 mm long; leaves or leaflets plane or with a recurved to revolute margin, the midrib usually raised on the abaxial surface (NT, Qld, NSW, Vic.).....**ser. 4. Valvatae**

17. Sepals narrowly deltate, abaxial surface with a moderately dense to dense stellate-pubescent; leaves imparipinnate; if sepals ovate-deltate then the leaves pinnate and plane, the adaxial surface of the leaflets glabrescent and a terminal leaflet greater than 8 mm wide.....**Boronia alulata species-group**
17. Sepals ovate-deltate, abaxial surface with a dense indumentum; leaves simple or rarely pinnate; if leaflets greater than 8 mm wide then adaxial surface with a sparse to dense indumentum.
18. Leaves simple, without secondary thickening within the slightly raised midrib, sessile; adaxial surface of petals with a moderate simple indumentum; inflorescence 1(–3)-flowered.....**Boronia rosmarinifolia species-group**
18. Leaves simple or pinnate, with secondary thickening in the prominently raised midrib, petiolate or if sessile then adaxial surface of petals glabrous; inflorescence 1-many-flowered.
19. Apex of sepal acuminate, if acute then anther-apiculum large and reflexed and leaf length:width ratio less than 5.
20. Leaves simple, base attenuate, adaxial surface glabrous or with few hairs along the midrib; inflorescence 1(–3)-flowered.....**Boronia foetida species-group**
20. Leaves simple or pinnate, base usually obtuse, adaxial surface glabrous or with a sparse to dense indumentum; inflorescence 1-many-flowered.....**Boronia lanceolata species-group**
19. Apex of sepal acute; anther-apiculum absent or minute, if present then leaf length:width ratio greater than 5.5.
21. Leaves simple, papery on drying, margin finely glandular warty (N coast NSW).....**20. B. chartacea (sp. group *incertae sedis*)**
21. Leaves simple or pinnate, firm, margin smooth (?Qld, NSW, Vic.).....**19. B. ledifolia (sp. group *incertae sedis*)**

#### Key to the species of *Boronia* sect. *Algidae*

1. Leaves simple, terete (SW WA).....**4. B. corynophylla**
1. Leaves pinnate, leaflets plane (ACT, NSW, Vic., SA).
2. Petals persistent with fruit, leaves 5–7 imparipinnate, petiolate (ACT, NSW, Vic.).....**2. B. algida**
2. Petals not persistent with fruit; leaves trifoliate (very rarely with 5 leaflets), sessile (SA).....**3. B. edwardsii**

#### Key to the species of *Boronia* sect. *Valvatae* s. str.

1. Sepals as long or longer than petals.
2. All leaves simple.
3. Plants, other than flowers, glabrous; stems purple and distinctly quadrangular, at least on young shoots; leaves glaucous; cocci glabrous.
4. Erect shrub growing on ridge tops; leaves sessile; sepals 6–10 mm long, petals 4–5 mm long.....**43. B. quadrilata**
4. Horizontal shrub growing on cliff faces; leaves petiolate; sepals and petals 2.5–3 mm long.....**44. B. viridiflora**
3. Plants sparsely to densely hirsute; stems brown, terete to slightly quadrangular; leaves not glaucous; cocci glabrous or hirsute.

5. Sepals as large as petals; leaves sometimes trifoliate when juvenile (Kimberley).....**60. B. pauciflora**
5. Sepals much larger than petals; leaves always simple (NT).
  6. Stellate hairs prominently stalked, rays 0.5–1 mm long; plants usually less than 50 cm tall; cocci glabrous; seed not striate at magnification.
    7. Hairs white and flexuous, new shoots pinkish to white; leaves narrowly elliptic; adaxial surface of petal glabrous.....**45. B. verecunda**
    7. Hairs yellow and straight, new shoots yellow; leaves elliptic; adaxial surface of petal hirsute.....**46. B. xanthastrum**
  6. Stellate hairs without prominent stalks, rays to 0.5 mm long; plants usually greater than 50 cm tall; cocci hirsute; seed striate at magnification.
    8. Older stems with massively developed cork; indumentum of leaves usually difficult to see with the unaided eye; rays of hairs to 0.1(–0.3) mm long.....**47. B. suberosa**
    8. Older stems not corky; indumentum of leaves clearly visible to the unaided eye; rays of hairs 0.1–0.5 mm long.
      9. Plants sprawling, sparsely to moderately hirsute (rarely densely hirsute on the abaxial leaf-surface only); sepals less than 8 mm long, sometimes enlarging to 11 mm long as fruit matures.
        10. Petals 2–2.5 mm long (to 4 mm long with fruit); peduncles 3.5–6(–11) mm long.....**53. B. aff. proluxa**
        10. Petals (2.5–)3–4.5 mm long (4–5 mm long with fruit), but if less than 3 mm long, then peduncle 0.5–2.5 mm long.
          11. Peduncles 0.5–2.5(–4) mm long.
            12. Hairs much denser on the abaxial surface of leaf than on adaxial, leaves less than 4 mm wide; sepals 3.5–4 mm long (enlarging to 6 mm long as fruit matures).....**51. B. aff. laxa 2**
            12. Hair equally dense on adaxial and abaxial surfaces of leaf, leaves usually greater than 4 mm wide; sepals 4–8 mm long (enlarging to 7–11 mm long as fruit matures)
            13. Sepals 4–6 mm long (enlarging to 7–8 mm as fruit matures).....**49. B. laxa**
            13. Sepals 6.5–8 mm long (enlarging to 11 mm as fruit matures).....**50. B. aff. laxa 1**
      11. Peduncles 6–21 mm long.
        14. Leaves lanceolate to ovate, the larger one much greater than 4 mm wide (smaller leaves sometimes present); lamina of leaf hairy, rays of stellate hairs not appressed.....**52. B. proluxa**
        14. Leaves narrowly elliptic, to 4 mm wide; lamina of leaf often glabrous to glabrescent, rays of stellate hairs appressed.....**54. B. amplexans**
  9. Plants erect (rarely sprawling but then with a hoary, dense indumentum), with a moderately dense to dense indumentum; sepals greater than 7 mm long, if less than 7 mm long then plant densely hirsute.
    15. Plants grey in appearance with a very dense indumentum, leaf epidermis not visible.....**48. B. grandisepala**
    15. Plants with a moderately dense indumentum, leaf epidermis visible.
      16. Petals greater than 4 mm long (enlarging to 5–6 mm long as fruit matures).....**48. B. grandisepala**
      16. Petals less than 4 mm long (enlarging to 5 mm long as fruit matures).....**50. B. aff. laxa 1**

## 2. Pinnate leaves present.

17. Juvenile leaves sometimes trifoliolate, adult leaves simple; simple leaves or leaflets never linear, glabrescent or glabrous.....**60. B. pauciflora**
17. Leaves with 3–55 leaflets, though first few leaves on a branch may be simple; leaflets often linear, indumentum sparse to dense.
  18. Leaves trifoliolate; leaflets plane, elliptic to oblanceolate; plant with a dense, stellate indumentum (SW WA).....**7. B. adamsiana**
  18. Leaves with 3–55 linear to narrowly elliptic, or rhombic leaflets, the margins plane to revolute; plants glabrescent or with a sparse to dense simple and/or stellate indumentum (Kimberley, NT, Qld).
  19. Sepals never as wide as the petals; inflorescence cymose with (1–)3–9 flowers; peduncle present; indumentum dense (NE and NW Qld).
  20. Leaflets elliptic to oblanceolate, (1–)3–7 mm wide (NE Qld) .....**29. B. quinkanensis**
  20. Leaflets linear to narrowly elliptic, c. 1 mm wide (NW Qld) .....**30. B. hoipolloi**
19. Sepals as wide or wider than petals; flower almost always solitary; peduncle absent or minute; indumentum sparse to dense (Kimberley, NT, NW Qld).
21. Most leaves with more than 25 leaflets; leaflets elliptic to rhombic.
  22. Terminal leaflets (1.5–)3–8 mm long, lateral leaflets 0.5–5 mm long; anthopodium (2–)6–21 mm long; abaxial surface of sepals glabrous or with few hairs at base.....**62. B. filicifolia**
  22. Terminal leaflets 1–3 mm long, lateral leaflets 0.5–1.5 mm long; anthopodium 1–6 mm long; abaxial surface of sepals with a sparse indumentum .....**63. B. minutipinna**
21. Most leaves with fewer than 25 leaflets per leaf; leaflets linear to elliptic.
  23. Leaves sessile; leaflets linear-elliptic, plane or slightly recurved along margins; lamina glabrescent or with a sparse, stellate indumentum.
  24. Branches obviously glandular; leaves trifoliolate .....**59. B. jucunda**
  24. Branches eglandular; leaves (3–)5–7(–9)-foliolate.
    25. Plants decumbent, with a sparse to moderately dense, simple indumentum, stellate hairs rare; leaflet-margins slightly recurved .....**57. B. decumbens**
    25. Plants erect, with a sparse stellate indumentum; leaflets plane ..... **58. B. tolerans**
23. Leaves petiolate, though petiole sometimes as small as c. 0.5 mm long; leaflets linear-elliptic to elliptic, the margins plane or recurved to revolute; lamina glabrescent or with a sparse to dense, stellate indumentum.
26. Sepals 3.5–6 mm long, of the same size as or slightly larger than petals; petals 2.5–4 mm long; anthopodium 7–24 mm long; with a sparse to moderately dense indumentum.....**61. B. kalumburuensis**
26. Sepals (4–)5–15 mm long, usually much larger than petals; petals 3–10 mm long; anthopodium 3–6(–10) mm long; indumentum sparse to dense.
  27. Leaflets linear to narrowly elliptic, so revolute that abaxial surface not usually visible; sepals (4–)5–14 mm long, glabrous or with a sparse to dense indumentum (NT, rarely E Kimberley, E of Ord River, NW Qld).....**55. B. lanuginosa**
  27. Leaflets elliptic to lanceolate, abaxial surface visible; sepals 5–9 mm long, with a dense indumentum (Kimberley, W of Ord River, rarely W NT in the Victoria R. area).....**56. B. wilsonii**



1. Sepals shorter than petals.

28. Stellate hairs, especially on petals, with fused rays and often appearing peltate; abaxial surface of sepals glabrous; plants glabrous or with a sparse indumentum; leaves pinnate (N Qld).

29. Leaflets linear; branches distinctly glandular; abaxial surface of petals with a sparse indumentum.....**10. *B. bowmanii***

29. Leaflets elliptic; branches not obviously glandular; abaxial surface of petals with a dense indumentum, scaly in appearance.....**11. *B. squamipetala***

28. Stellate hairs with distinct rays or absent; abaxial surface of sepals glabrous or with a sparse to dense indumentum; plant glabrous or with a sparse to dense indumentum; leaves simple or pinnate (NT, Qld, NSW, Vic., SW WA).

30. Pendulous shrubs growing on cliff faces; petals 2–2.5 mm long; leaves or leaflets plane, without a prominently raised midrib on the abaxial surface (NT) .....**20. *B. rupicola***

30. Erect or rarely pendulous shrubs; petals greater than 3 mm long, if shorter then leaves with a prominently raised midrib on the abaxial surface or with 15 or more leaflets, or leaflets less than 1 mm wide; leaf plane or with a recurved to revolute margin, the midrib usually raised on the abaxial surface (NT, Qld, NSW, Vic., SW WA).

31. Pinnate leaves present.

32. Both surfaces of adult leaves with a dense indumentum (no epidermis visible).

33. Leaves trifoliolate; leaflets plane, concolourous (SW WA).....**6. *B. ternata***

33. Leaves (1–)5–25-foliolate; leaflets slightly to strongly discolourous, leaflet-margins slightly recurved to strongly revolute (Qld).

34. Sepals ovate, 1.5 to 2 times as long as wide, the apex acuminate (central Qld).....**31. *B. duiganiae***

34. Sepals narrowly deltate, at least 2.5 times as long as wide, the apex acute (NE and NW Qld).

35. Leaflets elliptic to oblanceolate, (1–)3–7 mm wide; sepals 3–5 mm long (NE Qld)..... **29. *B. quinkanensis***

35. Leaflets linear to narrowly elliptic, c. 1 mm wide; sepals 2–3.5 mm long (NW Qld).....**30. *B. hoipolloi***

32. Adaxial surface of leaves without a dense indumentum (epidermis visible), abaxial surface of leaves glabrous or with a sparse to dense indumentum.

36. Leaflets strongly discolourous, indumentum of the abaxial surface dense and concealing the epidermis.

37. Sepals narrowly deltate, at least 2.5 times as long as wide, the apex acute.

38. Leaves trifoliolate (Blackdown Tbls of central Qld, SW WA).

39. Leaflets elliptic to oblanceolate, the margins recurved to slightly revolute, the abaxial surface visible and with a raised midrib (Blackdown Tbls of Central Qld).....**27. *B. obovata***

39. Leaflets linear, the margins revolute, concealing abaxial surface, the midrib not raised on the abaxial surface (SW WA).

40. Leaves sessile.....**8. *B. ericifolia***

40. Leaves petiolate.....**9. *B. revoluta***

38. Leaves (1–)5–17-foliolate (NSW, N or SE Qld).

41. Largest terminal leaflet greater than 20 mm long; largest lateral leaflet greater than 18 mm long; all leaflets 10–15 mm wide; petals 7–8 mm long (NSW).....**24. *B. umbellata***

41. Largest terminal leaflet usually less than 20 (to 25) mm long; largest

- lateral leaflet less than 18 mm long; all leaflets 1–9 mm wide; petals 3–12 mm long (NSW, Qld).
42. Leaflets less than 5 mm wide; petals 3–7 mm long, adaxial surface with a dense indumentum; abaxial surface of perianth often glabrous; anther-apiculum absent (N Qld).....**28. B. alulata**
42. Widest leaflets greater than 5 mm wide; petals (6–)8–12 mm long, adaxial surface with a sparse indumentum; abaxial surface of perianth never glabrous; anther-apiculum present though sometimes minute (NSW, SE Qld).
43. Largest leaflet usually less than 15 mm long; anthopodia 3–6(–10) mm long; cocci less than 6 mm long, glabrous; abaxial surface of petals with a moderately dense to dense indumentum; inflorescence 1–7-flowered; growing on granite (SE Qld) .....**26. B. amabilis**
43. Largest leaflet larger than 15 mm long; largest anthopodia usually 10 or more mm long; cocci c. 6 mm long, glabrous or with a moderately dense indumentum; abaxial surface of petal with a sparse or moderately dense indumentum; inflorescence 1–3-flowered; growing on sandstone or granite (NSW) .....**23. B. angustisepala**
37. Sepals ovate, 1.5 to 2 times as long as wide, the apex acute or acuminate.
44. Leaves trifoliolate; leaflets linear, the margins strongly revolute, concealing the abaxial surface (SW WA).
45. Leaves sessile.....**8. B. ericifolia**
45. Leaves petiolate.....**9. B. revoluta**
44. Leaves 1–11-foliolate, when trifoliolate leaflet-lamina elliptic, plane or with a recurved to revolute margin but the abaxial surface visible (Qld, NSW, Vic.).
46. Leaves of juvenile plants trifoliolate for several nodes, otherwise simple, the lamina plane or margin slightly recurved; peduncle less than 2 mm long; anthopodium 1–5 mm long; petals 5–7 mm long (Qld) .....**32. B. odorata**
46. Leaves imparipinnate, sometimes the more distal leaves unifoliolate, lamina plane or the margin recurved to revolute; peduncle (1–)2–10 mm long; anthopodium 7–11 mm long; petals (5–)8.5–12 mm long (Qld, NSW, Vic.).
47. Sepals acuminate or acute, 3.5–5 mm long, 2–3 mm wide; adaxial surface of leaves with a sparse to dense indumentum (Qld) .....**31. B. duiganiae**
47. Sepals acute, less than 3 mm long and 2 mm wide; adaxial surface of leaves glabrous or with a sparse indumentum (NSW, Vic.) .....**21. B. ledifolia**
36. Leaflets slightly discolourous or concolourous, indumentum of the abaxial surface not dense and not concealing the epidermis.
48. Plant glabrous apart from the adaxial surface of the petals and stamens; leaflets less than 1 mm wide; sepals less than 1.5 mm long; petals deciduous, 3.5–4.5 mm long (E Kimberley).....**5. B. anomala**
48. Indumentum present, sometimes present only on the perianth; leaflets usually greater than 1 mm wide; sepals 2–5 mm long; petals persistent, 2.5–12 mm long (W Kimberley, SW WA, Qld, NSW).
49. Leaves with (5–)15–55 leaflets; petals 2.5–4 mm long (W Kimberley) .....**61. B. filicifolia**



49. Leaves 1–15-foliolate or up to 25-foliolate and then leaves with a dense stellate indumentum; petals 4–12 mm long (SW WA, Qld, NSW).
50. Midrib not raised on the abaxial surface of the leaflets.
  51. Leaves trifoliolate, sessile or rarely with a petiole to 2 mm long; leaflets plane (even after drying), concolourous (SW WA) ..... **6. *B. ternata***
  51. Leaves 1–15-foliolate; petiole (1–)2–15 mm long; leaflets plane or margin recurved to recurved, slightly discolourous (Qld, NSW).
  52. Sepals narrowly ovate-deltate, at least as twice as long as wide.
  53. Leaves glabrescent or with a sparse indumentum; stellate hairs unstalked, yellowish; rays of stellate hairs less than 0.25 mm long, more or less straight, shiny ..... **15. *B. aff. granitica* (Bolivia Hill)**
  53. Leaves with a sparse to moderately dense indumentum; stellate hairs sometimes stalked, grey-white; rays of stellate hairs, to 0.5 mm long, flexuous and dull ..... **16. *B. granitica***
  52. Sepals ovate-deltate, less than twice as long as wide.
  54. Widest leaflet greater than 3 mm wide; peduncle 2–10 mm long; rachis segments 2–12 mm long; leaves sometimes trifoliolate, or sometimes younger distal leaves unifoliolate (NSW) ..... **12. *B. rubiginosa***
  54. Widest leaflet less than 3 mm wide; peduncle less than 3 mm long; rachis segments 3–5 mm long; leaves rarely 1–3-foliolate and then at first few nodes of branch only (Qld, NSW).
  55. Branchlets with prominent hemispherical glands; abaxial surface of sepals glabrous to glabrescent, or rarely (in N Qld) with a dense indumentum; petals 6–12 mm long (Qld) ..... **13. *B. eriantha***
  55. Branchlets not obviously glandular; abaxial surface of sepals with a moderately dense to dense indumentum; petals 5–7 mm long (NSW) ..... **14. *B. warrumbunglensis***
50. Midrib raised on the abaxial surface of the leaflets.
  56. Leaves with a moderately dense indumentum; rays of stellate hairs 0.1–0.75(–1) mm long (NSW) ..... **25. *B. mollis***
  56. Leaves glabrous or glabrescent; rays of stellate hairs to 0.25 mm long (NSW, Qld)
    57. Stems sharply quadrangular; stems and inflorescence glabrous or with a sparse indumentum; sepal tip acute (NSW) ..... **18. *B. fraseri***
    57. Stems terete to slightly quadrangular; stems and inflorescence with a moderately dense to dense indumentum; sepal tip acuminate (Qld) ..... **19. *B. keysii***
31. All leaves simple or unifoliolate.
  58. Petiole absent or to 2 mm long; lamina plane (even on drying), concolourous; the midrib not raised on the abaxial surface, not impressed on the adaxial surface; seed reniform, dull (SW WA) ..... **6. *B. ternata***
  58. Petiole absent or to 16 mm long; lamina plane or with margin recurved to revolute, discolourous; the midrib raised or not on the abaxial surface, impressed or not on the adaxial surface; seed elliptic in outline, dorsal side flattened, shiny, rarely dull (NT, Qld, NSW, Vic.).
  59. Leaves sessile.

60. Leaf with glandular punctate margin; sepals narrowly ovate-deltate, at least as twice as long as wide; rays of stellate hairs usually dull and flexuous ..... **17. B. repanda**
60. Leaf with smooth margin; sepals ovate-deltate, less than twice as long as wide; rays of stellate hairs shiny and usually more or less straight.
61. Leaves usually glabrescent, slightly discolourous, rarely (Pilliga Scrub of NSW) with a dense, minute indumentum on both surfaces; fruit hirsute (inland Qld, western slopes of NSW)..... **38. B. glabra**
61. Leaves strongly discolourous, adaxial surface of leaves glabrous and shiny, abaxial surface with a dense, stellate indumentum; fruit glabrous or densely hirsute (Qld, N coast of NSW).
62. Petals (6–)8–13 mm long; sepals (2.5–)3–6 mm long, (2–)3–4 mm wide; style glabrous or hirsute.
63. Leaves 1–2(–4) mm wide, the margins strictly revolute; anther-apiculum usually large and reflexed; style glabrous or hirsute; stellate hairs with rays to 0.1 mm long..... **35. B. splendida**
63. Leaves 2–6 mm wide, plane or the margin recurved, sometimes revolute on drying; anther-apiculum absent or minute; style glabrous; stellate hairs with rays to 0.5 mm long ..... **36. B. palasepala**
62. Petals 4–7.5 mm long; sepals 2–4 mm long, 1–2 mm wide; style glabrous.
64. Adaxial surface of petals glabrous or glabrescent; largest leaves greater than 35 mm long..... **40. B. excelsa**
64. Adaxial surface of petals with a sparse to moderately dense, simple indumentum; largest leaves usually less than 35 mm long.
65. Fruit glabrous or with a sparse indumentum, very rarely densely hirsute; anther-apiculum reflexed; stems terete to slightly quadrangular; sepals 2–4.5 mm long; petals 5–7.5 mm long (coastal and near coastal SE Qld and NSW) ..... **34. B. rosmarinifolia**
65. Fruit densely hirsute; anther-apiculum erect; stems quadrangular; sepals 2–2.5 mm long; petals 4–6 mm long (central and inland Qld)..... **37. B. forsteri**
59. Leaves petiolate or base so attenuate so as to appear petiolate.
66. Leaves glabrous or with a sparse to moderately dense indumentum on the abaxial surface, only slightly discolourous.
67. Leaves with prominently raised midrib on the abaxial surface, lanceolate to elliptic, the apex acute (Qld)..... **19. B. keysii**
67. Leaves without a prominently raised midrib on the abaxial surface, oblanceolate or spatulate to elliptic, the apex obtuse (NSW) ..... **12. B. rubiginosa**
66. Adult leaves strongly discolourous, with a dense indumentum (epidermis not visible) on the abaxial surface (juvenile leaves not so).
68. Adaxial surface of leaves glandular warty; leaf-margins glandular toothed; leaves not firm, papery when dry..... **22. B. chartacea**
68. Adaxial surface and margins of leaves smooth; leaves firm.
69. Staminal filaments glabrous or with 1 to 3 simple hairs; petals 2–5.5(–7 with fruit) mm long (NT, NW Qld)..... **33. B. lanceolata**
69. Staminal filaments moderately dense to densely pilose; petals 5–12 mm long (E Qld, NSW, Vie.).

- 70. Adaxial surface of petals glabrous or glabrescent.
  - 71. Leaves narrowly elliptic, widest leaves less than 6 mm wide (N Qld).....**40. *B. excelsa***
  - 71. Leaves elliptic, widest leaves greater than 6 mm wide (SE Qld).
    - 72. Sepals less than 3 mm long (before fruit development); petals 6–8 mm long; peduncles 2–3 mm long (Mt Walsh of Qld) .....**41. *B. foetida***
    - 72. Sepals 4.5–5 mm long (before fruit development); petals 9–10 mm long; peduncles to 0.5(–2) mm long (Many Peaks Ra. of Qld).....**42. *B. bella***
- 70. Adaxial surface of petals with a sparse to moderately dense indumentum of simple hairs.
  - 73. Sepal acuminate; leaf base strongly attenuate, adaxial surface glabrous or with few hairs along midrib (Hinchinbrook Is. of N Qld).....**39. *B. jensziae***
  - 73. Sepals acute, sometimes acuminate; adaxial surface of leaves with a sparse to moderately dense stellate indumentum; leaf base usually obtuse (central Qld, NSW, Vic.).
    - 74. Leaf-lamina elliptic, plane or margin slightly recurved (becoming revolute on drying); peduncle less than 2 mm long; anthopodium 1–5 mm long; petals 5–7 mm long (central inland Qld).....**32. *B. odorata***
    - 74. Leaf-lamina narrowly elliptic to elliptic, plane or margin recurved to revolute; peduncle (1–)2–10 mm long; anthopodium 7–11 mm long; petals (5–) 8.5–12 mm long (central coastal ?Qld, NSW, Vic.).....**21. *B. ledifolia***

***Boronia* sect. 1. *Alatae* Durretto**, sect. nov. Pili stellati absente. Inflorescentia paniculata, terminalis. Sepala alternae. Petala reduplicatae, persistentes. Semina tristia, brunnea. *Sp. typica*: *B. alata* Sm.

Growth antherotelic, *seasonal growth unit* not pseudodichotomous. Stellate hairs absent, simple hairs erect. Branches with decurrent leaf bases. *Leaves* imparipinnate, sometimes bipinnate, conduplicate, dorsiventral; the margins denticulate, plane to slightly recurved; the midrib raised slightly on the abaxial surface, spongy mesophyll continuous under midvein. *Inflorescence* a large, many-flowered determinate panicle with smaller units in axils of leaves immediately below terminal unit; prophylls and metaxephylls persistent. Sepals imbricate or opposite-decussate, appearing to be in two whorls, whorls separating as the flower matures, persistent with mature fruit. Petals reduplicate in bud, explanate (spread out flat) at anthesis, the midrib not raised on the abaxial surface, tip not inflexed, persistent, after anthesis petals become leathery and encase fruit. Stamens 8, all fertile, persistent; filaments pilose below glandular tip; antesealous filaments longer than antepetalous; anthers all equal, antepetalous anthers sometimes with appressed simple hairs. Disc glabrous. Gynoecium densely puberulous; style terminal on ovary; stigma globular, wider than style. *Seed* elliptical in outline, dull, usually brown, without ridge on adaxial side, surface at magnification tuberculate; tubercles unicellular, flat topped; placental endocarp, thin, yellow-white.

A monotypic section of coastal south-western Western Australia (Fig. 1), characterised by imparipinnate or sometimes bipinnate leaves, elliptic leaflets, a terminal paniculate inflorescence, and reduplicate petals that are persistent with mature fruit.

1. *Boronia alata* Sm., *Trans. Linn. Soc. London, Bot.* 8: 283 (1807). *Type citation*: "Discovered at King George's Sound, on the West Coast of New Holland, latitude 35°, by Mr. Archibald Menzies". *Type*: King George's Sound, on the West Coast of New Holland, lat. 35° [c. 35°S 118°E, Western Australia], *Mr. A. Menzies, 1803* (lectotype, here designated, LINN 684.3, *n.v.* (transparencies MEL 2041242, NSW, PERTH); isoelectotype LIV *n.v.* (photograph CANB)); West Coast of New Holland, *A. Menzies, 1792* (possible residual syntype BM *n.v.* (transparencies MEL 2041236, NSW, PERTH)).

*Zanthoxylum oppositifolium* DC., *Prodr.* 1: 728 (1824). *Type citation*: "in Novâ Hollandiâ. (v.s. in siné fl. ex Mus. Par.)." *Type*: *n.v.*, equated with *B. alata* by Benthams, *Fl. austr.* 1: 312 (1863). [*Boronia candollei* G. Don, *Gen. hist.* 1: 793 (1831) [*B. candollei sphalm*]; an illegitimate substitute for *Zanthoxylum oppositifolium* DC.]

*Boronia alata* var. *bipinnata* F. Muell., *Fragm.* 9: 111 (1875). *Type citation*: "Drumm. 89". *Type*: W.A., *Drummond 89* (holotype MEL 249151).

*Boronia vilhelmii* Domin, *Věstn. Král. České Společn. Nauk, Tř. Mat.-Přir.* 2: 51 (1923). *Type citation*: "W.A.: Yallingup and Cape Naturaliste. A.A. DORRIEN-SMITH (herb. Kew)." *Type*: *n.v.*, equated with *B. alata* by A.D. Chapman, *Austral. Pl. Name Index A-C*, 440 (1991).

*Illustrations*: R. Sweet, *Fl. australus.*, 48 (1827–8); A. Engler in A. Engler and K. Prantl (Eds), *Nat. Pflanzenfam. ed.* 2 19A: 251, Figs 107E–H (1931); Marchant *et al.*, *Fl. Perth Region Pt 1*: 478 (1987); M.G. Corrick and B.A. Fuhrer, *Wildflowers of Southern Western Australia*, 192 fig. 653 (1996); J. Wheeler, *Wildflowers of the South Coast*, 61 (1996).

Erect or in exposed areas prostrate, much branched *shrub* to 2.5 m tall and wide, resprouting from rootstalk, glabrous or sparsely hirsute. Simple hairs firm, erect, smooth, straight, shiny. Branches slightly to sharply quadrangular, eglandular, the hairs denser between decurrent leaf bases. *Leaves* 15–65 mm long, 10–40 mm wide in outline, with (3–)7–13 leaflets, not obviously glandular, lower leaves of branches usually bipinnate and lower pinnae with 3–5 leaflets; petiole 4–18 mm long, winged; rachis segments 3–15 mm long, 1–2 mm wide, winged, widest at the distal end; leaflets discolourous, paler beneath, elliptic to oblanceolate, sessile, the apex acute to obtuse, epicuticular wax platelets absent, glabrous or with few hairs on the midrib, the midrib impressed on the adaxial surface; terminal leaflet 5–20 mm long, 13–7 mm wide, shorter than laterals; lateral leaflets (2–)6–22 mm long, (1–)3–9 mm wide. *Peduncle* 2–24 mm long; prophylls and metaxyphylls minutely unifoliate, 0.5–3 mm long, c. 0.5 mm wide; secondary branches of inflorescence 2–10 mm long; anthopodium 3–13 mm long. Sepals narrowly deltate, 2.5–3.5 mm long, 0.5–1 mm wide, acute, ciliolate, not enlarging significantly as fruit matures. Petals pink, 7–12 mm long, 4–6 mm wide, enlarging slightly as fruit matures; abaxial surface sparsely pubescent, the hairs concentrated on the midrib; abaxial surface glabrous or with few scattered simple hairs. Filaments clavate, tapering at apex; antesepalous filaments c. 2 mm long, the distal 0.5 mm prominently glabrous-glandular; antepetalous filaments slightly tuberculate, c. 1.5 mm long; anthers attached to the apex of the filament, abaxial surface not frosty; anther-apiculum large and erect, glabrous. Disc entirely within stamen whorl. *Cocci* 4–5 mm long, 2–3 mm wide, moderately dense to densely hirsute. Seed 2.5–3 mm long, 1.5–2 mm wide, without ridge on adaxial side;



tubercles 10–44 µm across, irregularly fused, surface smooth, anticlinal walls not visible. *Winged Boronia*, or *Winged-Leaved Boronia*.

*Selected specimens examined (of c. 80 collections):* WESTERN AUSTRALIA; SOUTH-WEST BOTANICAL PROVINCE; DRUMMOND REGION: Rottnest Is., Nancy Cove, *I.R. Telford* 6733 and *G. Butler*, 12.viii.1977 (CANB); Mundaring Weir, 27 km E. of Perth, *R. Tate* (AD); Limestone cliffs, Minim Cove, Swan R. near Leighton, *L. Glauert* (PERTH); Garden Is., 32°11'E 115°21'S, *B.T. Goadby*, iii.1940 (PERTH); MENZIES and WARREN REGIONS: Cape Naturaliste, W side of Cape and Lighthouse 33°34'S 115°00'E, *R.W. Purdie* 4088, 10.xi.1990 (CANB, PERTH); Near Cape Leeuwin lighthouse, 34°22'S 115°10'E, *M.F. Duretto* 242-243 and *M. Bayly*, 27.viii.1992 (MFD242: MEL; MFD243: CANB, MEL); Cottesloe, *L. Glauert*, x.1925 (PERTH); Yallingup, 33°39'S 115°01'E, *G. Coghill* 1, 7.ix.1924 (AD, CANB); Black Rock, Redgate foreshore, 13 km SW of Margaret R., 34°00'S 115°00'E, *R.D. Spencer* 209 and *N. Walsh*, 2.ii.1989 (MEL); Point d'Entrecasteaux, *T.E.H. Aplin* 1449, 12.xii.1961 (PERTH); Rocky Bay near Walpole, *C. Andrews*, ix.1902 (PERTH); Shelly Beach; West Cape Howe, 30 km W of Albany, *G.J. Keighery* 9936, 10.xi.1986 (PERTH); Gull Rock Lake, 7 km S of Gull Rock Rd from intersection with Albany-Nanarup Rd, 12 km due E of Albany, 35°00'13"S 118°00'00"E, *N. Hoyle* 1507, 29.x.1985 (PERTH); King George Sound, *Robert Brown*, xii.1801 (CANB, MEL); EYRE REGION: 10 km W. of Esperance on coast, 33°52'S 121°47'E, *P.G. Wilson* 10050, 2.x.1970 (CANB, PERTH); Dempster Hill, Esperance, *J.H. Willis*, 16.xi.1950 (MEL); Middle Is., Recherche Archipelago, 34°06'S 123°10'E, *A.S. Weston* 8662 and *M.E. Trudgeon*, 14.xi.1973 (PERTH); Eclipse Is., 6 km from mainland, 35°11'S 117°53'E, *Boden* and *Forshaw*, 18.i.1975 (CANB, PERTH).

*Typification:* One collection is cited in the protologue of *B. alata*. Smith's herbarium is now lodged at LINN and a partial duplicate set is lodged at LIV (Edmondson 1993). Specimens matching the specimen cited have been located at LINN and LIV. As the LINN collection is fertile (the LIV specimen is infertile) and in better condition it is here designated the lectotype. Another specimen of note, 'West Coast of New Holland, *Menzies*, 1792' (BM), could be considered a possible residual syntype.

*Synonymy:* Mueller (1875, p. 111) described *B. alata* var. *bipinnata*, a bipinnate variety, from a specimen collected by Drummond. *Boronia alata* is a remarkably uniform species, and most specimens have bipinnate leaves on the lower parts of the branches, and accordingly Mueller's variety is placed in synonymy.

*Notes:* *Boronia alata* occupies an isolated position in *Boronia*, but is probably sister, along with *Boronia* sect. *Algidae*, to *Boronia* sect. *Valvatae* s. str. (Duretto and Ladiges 1999). The reduplicate petals (with margins bent abruptly outward with inner faces touching without overlapping) give the flower bud a four-winged appearance which is unique in *Boronia*.

*Distribution and ecology:* *Boronia alata* occurs in coastal and near coastal areas from Perth to Esperance and the adjacent islands including the Recherche Archipelago, South-west Botanical Province, Western Australian (Fig. 1). The species has rarely been collected between Albany to Esperance. *Boronia alata* grows mainly on calcareous soils and is found on the basins and orogens bordering the Yilgarn Craton (as outlined by Trendall, 1990). The Yilgarn Craton itself is made up of granites, gneisses and other metamorphics and underlies a large part of the South-west Botanical Province, including most coastal areas between Albany and Esperance. The rocks of the Yilgarn Craton probably do not provide suitable habitat for *B. alata*. *Boronia alata* grows down to the surf-spray zone where it is often prostrate, it otherwise can form monotypic and dense stands, or be part of the shrubby understorey *Eucalyptus* L'Herit. or *Corymbia* K.D. Hill & L.A.S. Johnson woodland or forest. Flowering and fruiting: September-February.

*Conservation status:* Common and widespread, found in various reserves and not under threat, except in the Perth region.

**Boronia** sect. 2. *Algidae* Duretto, sect. nov. Pili stellati absente. Ramificatio pseudodichotoma. Inflorescentia cymosa, terminalis; bractae glumacei. Sepala alternae. Petala valvata. Semina tristia. *Sp. typica*: *B. algida* F. Muell.

Growth antheralic, *seasonal growth unit* pseudodichotomous. Stellate hairs absent, simple hairs erect. Branches with decurrent leaf bases. *Leaves* simple or imparipinnate, conduplicate, dorsiventral, margin entire, lamina plane or sub-terete; the midrib not raised on the abaxial surface, spongy mesophyll continuous under midvein. *Inflorescence* terminal, cymose, 1(–3)-flowered; peduncle absent, rarely to 0.5 mm long; prophylls and metaxephylls persistent, glumaceous. Sepals opposite-decussate, whorls not separating as flower matures, persistent with mature fruit. Petals valvate in bud, explanate (spread out flat) at anthesis, persistent and enclosing mature fruit (*B. algida*) or caducous (*B. edwardsii*), the midrib not raised on the abaxial surface, tip not inflexed. Stamens 8, all fertile, persistent or caducous; filaments glabrous or pilose (*B. corynophylla*), the distal end glandular, antesepalous filaments longer than antepetalous filaments; anthers equal, glabrous. Disc glabrous. Gynoecium glabrous or puberulous (*B. corynophylla*); style terminal on ovary; stigma globular and much wider than the style or scarcely wider than the style (*B. corynophylla*). Seed elliptical, adaxial side slightly flattened, without ridge, dull, grey to black, with or without tubercles; placental endocarp thin, yellow-white.

A section with three species, *B. algida* in New South Wales and Victoria, *B. edwardsii* in South Australia, and *B. corynophylla* in south-western Australia (Fig. 1). The section is characterised by the pseudodichotomous branching, sheathing and brown prophylls, imbricate sepals and valvate petals.

2. *Boronia algida* F. Muell., *Trans. Philos. Soc. Victoria* 1: 100 (1855). *Type citation*: “On the highest stony declivities of our Alps; for instance on Mt Hotham, Mount La Trobe, and Mount Kosciusko”. *Type*: Australian Alps: Near the summits of Mount Hotham [36°59'S 147°08'E] and Mount Latrobe [= Mt Loch, 36°57'S 147°09'E] at the height of about 5 or 6000' [1524–1829 m] [Victoria], *F. Mueller*, xii.1854 (lectotype, here designated, MEL 2041200); Australian Alps, *F. Mueller* (probable isoelectotype BM n.v. (transparencies MEL 2041237, NSW)); Mount Hotham, 5–6000' [36°59'S 147°08'E, Vic.], *F. Mueller* (probable isoelectotype K n.v. (cibachrome MEL 2041205; photograph AD 99548109), MEL 258132, MEL 258133); Declivities of Mount Hotham [36°59'S 147°08'E, Vic.], *F. Mueller* ? (possible isoelectotype MEL 258136); Mt Latrobe [= Mt Loch, 36°57'S 147°09'E, Vic.], 5000 ft, *F. Mueller* (probable isoelectotype TCD).

*Illustrations*: N.C. Burbidge and M. Gray, *Fl. Australian Capital Territory* 241, fig. 235 (1970); J.H. Willis, B.A. Fuhrer and E.R. Rotherman, *Field Guide to the Flowers and Plants of Victoria* 275, t. 396 (1975); L. Cronin, *Concise Austral. Fl.*, 80 (1989); A. Fairley and P. Moore, *Native Plants of the Sydney District*, 234, t 807 (1989); P.H. Weston and M.F. Porteners, *Fl. New South Wales* 2: 231 (1991).

Erect, much branched *shrub* to 1 m tall, resprouting from rootstalk. Hairs, firm, smooth, straight, shiny. Branches terete to slightly quadrangular, glandular, moderately dense to densely hirsute, the hairs denser between the decurrent leaf bases, sometimes the areas not between the decurrent leaf bases glabrous. *Leaves* 8–15 mm long, 4–5 mm wide, glandular, glabrous or with few hairs on the midrib, imparipinnate, with (3–)5–7(–9) leaflets; petiole 0.5–1 mm long, sometimes winged; rachis 1–4 mm long, 0.5–1 mm wide, segments winged, widest at the distal end; leaflets sessile to subsessile, petiolule to 0.5 mm long, lamina oblanceolate, the apex obtuse to deeply emarginate, discolourous, paler



beneath, epicuticular wax platelets absent; the midrib not impressed on the adaxial surface; terminal leaflet shorter than laterals, 2–8 mm long, 1–3.5 mm wide, the midrib  $\pm$  reflexed; lateral leaflets 2–9 mm long, 1–4.5 mm wide. *Inflorescence* glabrous or sparsely (rarely moderately dense) puberulous; prophylls and metaxyphylls brown, 1.5–3 mm long, 1–2 mm wide, ciliolate; anthopodium 0.5–5 mm long. Sepals broadly ovate-deltate, 1–2.5 mm long, 0.5–1.5 mm wide, acute, glabrous or ciliolate, not enlarging significantly as fruit matures. Petals pink or white, 4–7 mm long, 2.5–3 mm wide, persistent, enlarging slightly to enclose mature fruit, adaxial surface glabrous or with a sparsely to moderately dense puberulous, abaxial surface glabrous. Stamens persistent; filaments clavate, glabrous, tapering apex; antesealous filaments c. 1.5 mm long, the distal c. 0.5 mm prominently glandular; antepetalous filaments 0.5–1 mm long, tuberculate; anthers attached to the apex of the filament or subapical, abaxial surface not frosty; anther–apiculum absent or minute to large, erect to reflexed. Disc entirely within stamen whorl. *Cocci* 2.5–3 mm long, 1.5–2 mm wide, glabrous. Seed 2–2.5 mm long, 1–1.5 mm wide, surface at magnification tuberculate; tubercles erect, firm or collapsed, unicellular, not fused, surface textured or smooth, tips flat, anticlinal walls  $\pm$  visible. *Alpine Boronia*.

*Selected specimens examined* (of c. 80 collections): NEW SOUTH WALES; NORTHERN TABLELANDS: Tungsten via Deepwater, T.D. Lynch, x.1913 (NSW); Silent Grove, c. 22 miles N of Emmaville, C.F. Constable 2033, 27.xi.1962 (MEL, NSW); Raspberry Look Out, c. 60 km NE of Glen Innes via Gwydir Hwy, Gibraltar Range NP, 29°33.5'S 152°15'05"E, P. Hind 5246 and G. D'Aubert, 5.viii.1987 (NSW); 3 miles c. E of Backwater by road, 18 miles NE of Guyra, 30°05'S 151°55'E, D.J. McGillivray and R. Coveny 3606, 21.iv.1971 (CANB); CENTRAL TABLELANDS: Near Winbornale Dam, E of Bathurst, G. and C.K. Ingram, 13.xii.1964 (NSW); SOUTHERN TABLELANDS (including the A.C.T.): Moreton NP, c. 61 km from Braidwood on Braidwood–Nowra Rd, 35°05'S 150°08'E, K. O'Ryan 31 and R. Windsor, 13.viii.1984 (CANB, MEL); Mittagong, R.L. Badgery, x.1969 (NSW); Tolwong turn off, Nerriga–Jervis Bay Rd, R. Pullen 2024, 8.ii.1972 (CANB); Tinderry Mts, 13.2 km ESE (by road) of Michelago on the Jerangle Rd, 35°44'S 149°16'E, R. Coveny 6335, P. Hind and M. Parris, 17.v.1975 (CANB); Kydra Reefs, 36°23'S 149°20'E, M.D. Tindale 4012, M. Parris and D. Wimbush, 17.i.1975 (CANB); Slopes of Brindabella Range along Bundora Dam, Cotter River District, R. Pullen 2987, 6.xii.1961 (CANB, MEL); Wadbilliga NP, 400 m W of Kydra, 36°24'30"S 149°30'10"E, J.D. Briggs and M. Parris 2079, 28.x.1986 (CANB); Ridge Top 70 m S of trig point, Wog Wog Mtn, Nalbaugh NP, 37°05.5'S 149°25.5'E, J.D. Briggs and P. Weston 1810, 26.iii.1985 (CANB); Schlink Pass Rd, Snowy Mts, Kosciusko 210861, J.I. Raine ANU10385, 4.xii.1972 (CANB); SOUTH COAST: Pebbly Beach a few miles N of Batemans Bay, G. Armstrong 1968A and B, 22.viii.1972 (NSW); VICTORIA: Valley below The Castle and near Whale Rock, Mt Buffalo, R. Melville 2629, 29.xii.1952 (MEL); Mt Hotham area, 36°59'20"S 147°09'30"E, V46, S.J. Forbes 411, 20.xi.1979 (CANB, MEL); Nunniong Plateau, Brumby Point, 37°03'16"S 148°04'38"E, M.G. Corrick 10173, 2.i.1987 (MEL); Mt Wellington (S36), A.C. Beauglehole ACB41139, 8.i.1973 (MEL); Bogong High Plains, creek draining Little Round Plain to western tributary of Kiewa R., western branch, 36°52'10"S 147°11'30"E, E.A. Chesterfield 1848, 3.xii.1986 (MEL).

*Typification*: Mueller (1855) cited no specimens when describing *B. algida* stating only where the species was found. A Mueller collection with notes matching the description and distributional data cited by Mueller (see above) has been located at MEL and is designated the lectotype. Possible duplicates are lodged at BM, K and TCD. There has been some confusion in the past on the date of publication of several of Mueller's species (including *B. algida*) as Mueller published these taxa in both 1855 and 1856 (Mueller 1855, 1856). The 1855 publication was valid, while the 1856 publication was a re-iteration of the original manuscript for the benefit of European Botanists (Seberg 1986).

*Notes*: *Boronia algida* is one of the few boronias found in alpine and subalpine



Fig. 1. Distribution of *Boronia* sect. *Alatae*: *B. alata* (■); *Boronia* sect. *Algidae*: *B. algida* (○), *B. edwardsii* (●), *B. corynophylla* (★); *Boronia* sect. *Valvatae*: *B. anomala* (▲).

communities, and not easily confused with any other species. Mueller (1855) wrote that this species is charming, and allied to *B. rubiginosa*. *Boronia algida* is most closely related to *B. edwardsii* (Weston *et al.* 1984; Duretto and Ladiges 1999) from which it can be distinguished by having persistent petals and stamens, and petiolate leaves that have 5–7 leaflets. These leaf characters also distinguish *B. algida* from *B. corynophylla*. The chromosome number for *B. algida* is  $n=10$  (Stace and Armstrong 1992), which, as far as is known, is unique in *Boronia* (*l. c.*; Stace *et al.* 1993).

**Distribution and ecology:** *Boronia algida* is found at higher altitudes south from Gibraltar Range and Emmaville, New South Wales, to the Bogong High Plains of Victoria (Fig. 1). It occurs in heathy, woodland and forest communities on sandy soil derived from granite or sandstone. There is an isolated coastal population at Pebbly Beach near Batemans Bay on the South Coast of New South Wales. Flowering: August–May; fruiting: October–May.

**Conservation status:** Common, widespread, and well represented in reserves, and not under threat.

3. *Boronia edwardsii* Benth., *Fl. austral.* 1: 312 (1863). *Type citation*: “S. Australia. Mount Barker, Edwards” *Type*: Heaths of Mount. Barker, South Australia, H. Edwards, Sept. 1860 (lectotype, here designated, MEL 707566).

*Illustrations:* J.M. Black, *Fl. South Australia*, 491 Fig. 644E (1948); N. Alcock, *Australia Pl.* 8: 244 (1976); J.A. Armstrong and I.R. Telford, *Fl. South Australia* Pt 2: 772, Fig. 413A (1986); A. Prescott, *It's Blue with Five Petals: Plants of the Adelaide Region*, 217, Fig. 2 (1988); G.R.M. Dashorst and J.P. Jessop, *Plants of the Adelaide Plains and Hills*, 96, Pt 41.2-2a (1990); Holliday *et al.*, *Kangaroo Is. Native Plants*, 24 (1994).

Erect, much branched *shrub* to 1 m tall, resprouting from rootstalk. Hairs, firm, smooth, straight, shiny, 0.05–0.25 mm long. Branches terete to slightly quadrangular, decurrent leaf bases present on younger branches, not obviously glandular, sparsely to densely puberulous, the hairs denser between the decurrent leaf bases. *Leaves* sessile or rarely petiolate, in outline 3–16 mm long, 3–15 mm wide, trifoliate, very rarely uni- or 5-foliate,  $\pm$  glandular; petiole to 2 mm long, winged or not; rachis segments 1–3 mm long, c. 1 mm wide, winged, widest at the distal end; leaflets sessile to subsessile, petiolule to 0.5 mm long, lamina oblanceolate, the apex obtuse, discolourous, paler beneath, epicuticular wax platelets absent, glabrous or sparsely to moderately dense puberulous, the midrib not impressed on the adaxial surface; terminal leaflet longer than laterals, 1.5–14 mm long, 0.5–5 mm wide; lateral leaflets 2–10 mm long, 0.5–3 mm wide. *Inflorescence* glabrous or rarely glabrescent; peduncle absent; prophylls and metaxephylls brown, 0.5–1 mm long, c. 0.5 mm wide, ciliolate; anthopodium 2–7 mm long. Sepals broadly ovate-deltate, 1–1.5 mm long, 0.5–0.75 mm wide, acute, glabrous or ciliolate, not enlarging significantly as fruit matures. Petals pink or white, 5–8 mm long, 2–4 mm wide, caducous; adaxial surface with a moderately to dense indumentum; abaxial surface glabrous. Stamens caducous; filaments clavate, glabrous, tapering at apex; antesepalous filaments c. 1.5 mm long, prominently glandular on the distal 0.5–1 mm; antepetalous filaments tuberculate, 0.5–1 mm long; anthers attached to the apex of the filament, glabrous, abaxial surface not frosty; anther-apiculum large, erect or slightly reflexed. Disc entirely within stamen whorl. Stigma almost sessile. *Cocci* 3–4 mm long, 2–2.5 mm wide, sparsely to moderately dense puberulous. Seeds 2.5–3 mm long, 1.5–2 mm wide; surface at magnification not tuberculate but with a fine relief of folds perpendicular to  $\pm$  visible anticlinal walls. *Island Boronia*.

*Selected specimens examined* (of c. 60 collections): SOUTH AUSTRALIA: SOUTHERN LOFTY RANGES: Myponga Tiers, Myponga, c. 35°24'S 138°28'E, *Bell*, 10.x.1924 (AD); Hindmarsh Tiers - c. 10 km N of Victor Harbour, *E. H. Ising*, x.1924 (AD); Fleurieu Peninsula, Mt Scrub, Waitpinga, c. 74 km S of Adelaide, *Black*, 27.i.1933 (AD); Fleurieu Peninsula, near Tunkalilla Beach, c. 25 km WSW of Victor Harbour or 25 km WSW of Myponga, 35 km S of Adelaide, *J.B. Cleland*, 9.xi.1967 (AD); Filsell hill near Forest Range, c. 20 km E of Adelaide, 34°58'S 138°48'E, *A.G. Spooner* 5278, 17.vii.1977 (AD); Mt Lofty Range, Mt Carey c. 15 km ESE of Adelaide, *J.B. Cleland*, 26.x.1946 (AD); MURRAY: Region 9 - Murray (Mallee Plains), c. 3 km SW of Geranium (Geranium is c. 90 km ESE of Murray Bridge), *A.B.G. Trainee* 68, 14.ix.1970 (AD); KANGAROO ISLAND: 9 miles E of Rocky R., *M.E. Phillips*, 31.viii.1964 (AD); 15 miles W of Cygnet River P.O., *H.M. Cooper*, 2.i.1945 (AD); Hundred of Cassini, *F. Mowling*, x.1980 (AD); Ravine de Casears, *G.F. Gross*, 20.x.1951 (AD); Tunkilla Ck, *F.M. Hillon*, 25.xi.1953 (AD); Parndana Conservation reserve, c. 6 km due NE of Parndana, NW corner of park, 35°45'20"S 137°18'40"E, *E.N.S. Jackson* 4364, 21.viii.1982 (AD); Gosse Crown Land, c. 3.5 km from West End Hwy, 35°50'S 136°53'E, *B.M. Overton* 737, 30.xi.1985 (AD); Middle R. dam, 35°52' 137°20'E, *A.G. Spooner* 4796, 9.x.1976 (AD); c. 12 km E of Cape Borda, by main road (Kingscote-Cape Borda), 35°50'S 139°15'E, *R. Schodde* 533, 29.xii.1957 (AD); South Coast Hwy, 9 miles W of Stunsail Boom R., *V. Johnson* 75/74, 11.x.1975 (NSW); Hundred of Gosse, 35°40'S 136°45'E, *T. Dendy* 114, (AD); Near Tandanya, South Coast Rd, 3.7 km E of Flinders Chase NP, Kangaroo Is., 35°58'S 136°49'E, *P.C. Heylingers* 80096, 5.x.1980 (AD, CANB).

*Typification:* Bentham (1863) cited only one collection of this species. He also stated it was the only specimen he had seen and that it was from Mueller's herbarium. This specimen, with annotations made by Bentham, has been located at MEL and is designated the lectotype.

*Notes:* *Boronia edwardsii* differs from *B. algida* in having deciduous petals (and stamens), and by nearly always having trifoliolate and sessile leaves. The leaf characters also distinguish it from *B. corynophylla*.

*Distribution and ecology:* *Boronia edwardsii* is common on Kangaroo Island, but rare on the adjacent Fleurieu Peninsula, South Australia (Fig. 1). Jessop (1983, 1984) lists the York Peninsula as part of the range of this species but no specimens have been seen from this area (see also Jessop 1993). This species is found in heath and open woodland usually on laterites or ironstones (Holliday *et al.* 1994). Flowering: August–December; fruiting: September and January.

*Conservation status:* This species was given a ROTAP code of 3RC- by Briggs and Leigh (1988) but was not listed by Briggs and Leigh (1996). The species is adequately conserved on Kangaroo Island in Eric Bonython C.P., Filsell Hill C.P., Flinders Chase N.P. and Ferrics-McDonald C.P. (Briggs and Leigh 1988), but is inadequately conserved on the mainland where populations are small and isolated (Holliday *et al.* 1994; pers. obs.).

**4. *Boronia corynophylla*** Paul G. Wilson, *Nuytsia* 12: 142 (1998), fig. 9. *Type:* 13 km south-west of 90 Mile Tank, Frank Hann N.P., 27.x.1980, K. R. Newbey 7827 (holotype PERTH 01258486).

Spreading *shrub* to 30 cm high. Hairs, firm, smooth, antrorsely curved, shiny, 0.05–0.1 mm long. Branches terete, sparsely and minutely puberulous, cuticle exfoliating and forming a grey scurfy covering, decurrent leaf bases not present, not obviously glandular. *Leaves* simple, slender-terete to narrow-fusiform or narrow-clavate, sessile, 7–10 mm long, c. 1 mm wide, concolourous, minutely puberulous. *Inflorescence* 1–3-flowered; peduncle absent; prophylls and metaxephylls, 0.5–1.25 mm long, ciliolate; anthopodium 1–2 mm long. Sepals ovate, ciliolate, 2–3 mm long, c. 1 mm wide. Petals pale red, c. 4.5–5 mm long, c. 1.5–2 mm wide; adaxial surface with a moderately dense indumentum of erect simple hairs, becoming more recurved towards the margins; abaxial surface generally glabrous but with few simple hairs near the margins. Staminal filaments tapering at apex, pilose; antesealous filaments c. 1.5–2 mm long, prominently glandular on the distal 0.5–1 mm; antepetalous filaments tuberculate, 0.5–1 mm long; anthers attached to the apex of the filament, glabrous; anther-apiculus erect. Disc entirely within stamen whorl. Style c. 0.5–0.75 mm long, puberulous with recurved simple hairs; stigma not or scarcely larger than the style. *Fruit* and seed not seen.

*Additional specimen examined:* WESTERN AUSTRALIA: SOUTH-WEST PROVINCE: AVON DISTRICT: 13 km SW of 90 Mile Tank, Frank Hann N.P., K. Newbey 6477, 11.xi.1979 (PERTH).

*Notes:* *Boronia corynophylla* is distinguishable from all other species of *Boronia* by its simple leaves, imbricate sepals, valvate petals and the grey scurfy covering on the branches. This species was not included in the cladistic analysis of *Boronia* sect. *Valvatae* s. lato presented by Duretto and Ladiges (1999). The valvate petals, pseudodichotomous branching and the ovate, brown prophylls clearly place *B. corynophylla* in *Boronia* section *Algidae*. It differs from *B. algida* and *B. edwardsii* in having simple leaves, pilose staminal filaments, puberulous ovary and the continuous style and stigma. The taxonomic position of *B. corynophylla*, as presented in this treatment, will be tested in a forthcoming cladistic analysis of *Boronia*.

*Distribution and ecology:* *Boronia corynophylla* is known from two collections that



were made at the same locality in the Frank Hann N.P., c. 90 km north-east of the Lake King township, south-western WA. It was found growing in *Eucalyptus salmonophloia* F. Muell. open woodland on clayey sand (Wilson 1998).

*Conservation status:* Wilson (1998) gave *B. corynophylla* a Priority Two classification following the Conservation Codes for Western Australian Flora. A ROTAP code of 2EC+ is appropriate for this species. Wilson (1998) noted that in 1996 *B. corynophylla* could not be located where it had previously been collected and this could be because the area had been burnt the previous year. Surveys are urgently required to ascertain the size and extent of the known population of *B. corynophylla*.

***Boronia* sect. 3. *Valvatae* (Benth.) Engl., *Nat. Pflanzenfam.* 3(4), 135 (1896). *Sp. typica:* sub infra *Boronia* ser. *Valvatis* indicatur.**

*Boronia* subg. *Robonia* Rchb., *Iconogr. bot. exot.* 54 (1827). *Sp. typica:* *Boronia ledifolia* (Vent.) DC.

*Boronia* sect. *Valvoboronia* Kuntze in T.Post and Kuntze *Lex. gen. phan., Prosp.*, 74 (1903); *nom. illeg.*, illegitimate substitute for *Boronia* sect. *Valvatae* (Benth.) Engl.

*Growth* blastotelic. Multiangular stellate hairs present, if only on flowers, or rarely absent (*B. anomala*); rays unicellular, epidermal; simple hairs erect or antrorse. Branches usually without decurrent leaf bases, with little or no cork development on older stems (except *B. suberosa*), not obviously glandular (except *B. eriantha*). *Leaves* simple, unifoliate or imparipinnate, the lamina conduplicate, dorsiventral or isobilateral, not obviously glandular, scattered nonsecretory glands in mesophyll; the margins entire, rarely glandular-crenulate (*B. repanda*), plane to revolute; the midrib sometimes raised, spongy mesophyll continuous under midvein or tightly packed tissue between midvein and abaxial epidermis. *Inflorescence* axillary, cymose or 2-nodal botryoids in which the second internode of the primary axis and the basal internodes of the secondary branches are reduced to vestiges (cf. Weston 1990), 1-many-flowered; prophylls and metaxyphylls persistent. Sepals valvate in bud, persistent with mature fruit. Petals valvate in bud, usually explanate (spread out flat) at anthesis, tip not inflexed, persistent or rarely caducous (*B. anomala*), after anthesis petals become dry and chartaceous and encase fruit. Stamens 8, all fertile, persistent or rarely caducous (*B. anomala*) with mature fruit; filaments usually pilose on the abaxial surface and the margins below the glandular tip, each gland usually bearing a minute stellate hair; antesepalous filaments longer than antepetalous; anthers equal or unequal, glabrous. Disc glabrous (except *B. ledifolia*, *B. angustisepala*, *B. umbellata*). Ovary glabrous, rarely hirsute (*B. repanda*); style terminal on ovary, pilose or glabrous; stigma rounded, not or scarcely wider than style. *Seeds* black or grey, elliptical to reniform, adaxial side flattened, shiny or dull; surface at magnification tuberculate to colliculate, rarely colliculate-foliate (*B. viridiflora*); tubercles unicellular, 6–55 µm across; placental endocarp (elaiosome) thick to thin, usually persistent, yellow-white.

*Boronia* sect. *Valvatae* contains approximately 56 species that are found in all states except South Australia and Tasmania (Fig. 2). It is characterised by axillary inflorescences, valvate sepals and petals that persist with the mature fruit, and the presence of stellate hairs (except *B. anomala*, sp. 5 below). The section is classified into four subsections, nine series and five subseries. One species, *B. anomala*, is placed as *insertae sedis* in the section.

Larvae of the butterfly genus *Nesolycaena* (four species, family Lycaenidae) feed exclusively on members of *Boronia* sect. *Valvatae* (Braby 1996 and references therein).



Fig. 2. Distribution of *Boronia* sect. *Valvatae* s. str.

*Nesolycaena* is the only known butterfly genus to feed on *Boronia* (Braby pers. comm.). The larval food plant of *N. albosericea* is *B. glabra* (Sands 1971), *B. odorata* and *B. obovata* (Braby pers. comm.); of *Adaluma urumelia* (= *N. urumelia*, see d'Apice and Miller 1996) is *B. lanceolata* (Edwards 1980); and of *N. medicea* is *B. eriantha* (Braby 1996). *Nesolycaena caesia* was observed on and around what was probably *B. kalumburuensis* and *B. wilsonii* (called *B. filicifolia* and *B. lanuginosa* respectively by d'Apice and Miller 1992) and has been collected from where *B. filicifolia* is found (see Braby 1996).

5. *Boronia anomala* Duretto, sp. nov. (*subsect. incertae sedis*). Ab aliis speciebus *Boroniae* sectionis *Valvatarum* (Benth.) Engl. omnino glabro praeter petala et stamina, foliolis linearis anguste (0.5–0.75 mm latis), et petalis caducis differt. *Type*: 10 km ENE Kalumburu, Kimberley, Western Australia, 14°14'S 126°44'E, R.K. Harwood 169 & J. Russell-Smith, 20.vi.1997 (holotype MEL 2044558 (transparency DNA); isotype DNA 132848 (2 sheets) (transparencies MEL 2044559, MEL 2044560).

Erect *shrub* to 60 cm tall, glabrous apart from petals and stamens, stellate hairs absent. Branches eglandular, quadrangular in transverse section, decurrent leaf bases present. *Leaves* 3–5-foliolate, 40–55 mm long, 35–100 mm wide; petiole 8–14 mm long; rachis segments 8–10 mm long, linear; leaflets linear, the midrib not raised on the abaxial surface but impressed on the adaxial surface, dorsiventral, tightly packed tissue without



secondary thickening between midvein and epidermis; terminal leaflet 17–42 mm long, 0.5–0.75 mm wide; lateral leaflets (8–)17–50 mm long, 0.5–0.75 mm wide. *Inflorescence* 1–3-flowered; peduncle 4–10 mm long, persistent; secondary peduncles 1–3 mm long; prophylls 0.5–4 mm long, unifoliate linear, persistent; anthopodium 8–10 mm long. Sepals deltate, c. 1.25 mm long, c. 0.5 mm wide, persistent (aestivation unknown). Petals 3.5–4.5 mm long, deciduous; adaxial surface with a narrow band of minute, simple hairs along margin. Filaments clavate, suddenly narrowing at apex so as to appear truncated before connecting to anther, pilose along the margins below glandular tip; antesealous stamens c. 2 mm long; antepetalous filaments c. 0.5 mm long; anthers attached to the apex of the filament, antesealous anthers c. 0.5 mm long, antepetalous anthers c. 1 mm long; anther-apiculum small, erect, slightly tuberculate. Disc entirely within stamen whorl. Style c. 1 mm long, stigma scarcely larger than style. *Cocci* 4.5–5 mm long, 2–2.5 mm wide. Seed (mature seed not seen) elliptical, black, shiny, possibly slightly rugulose, adaxial side flattened and without ridge.

*Specimen examined*: Known only from the type collection.

*Affinities*: The phylogenetic position of *B. anomala* is uncertain. Two features that are critical in the systematics of *Boronia*, mature seeds and the aestivation of the sepals, have not been seen. This species does have valvate petals and axillary inflorescences which is a combination of characters that, in *Boronia*, is found only in *Boronia* sect. *Valvatae*. Also, the prophylls are leaf-like as they are in other members of *Boronia* sect. *Valvatae*. The species of the other sections of *Boronia* have prophylls (and metaxephylls) that are more sepal-like in appearance. *Boronia anomala* differs from the other members of *Boronia* sect. *Valvatae* by not having stellate hairs and its deciduous petals. Also, unlike *Boronia* sect. *Valvatae* but as with many members of *Boronia* sect. *Boronia* and *Boronia* sect. *Cyanothamnus*, the anthopodia of *B. anomala* have what is best described as decurrent sepal bases that are analogous to the decurrent leaf bases of the branches. The seeds of *B. anomala* appear to be slightly rugulose as are those of *Boronia* sect. *Imbricatae* and *Boronia* sect. *Cyanothamnus*, but mature seeds are needed to confirm this feature (immature seeds in *Boronia* are often wrinkled).

*Boronia anomala* was not included in a recent cladistic analysis of *Boronia* sect. *Valvatae* s. lat. (Duretto and Ladiges 1999). In that analysis, all species found in the Kimberley region (WA) and the Northern Territory, except *B. lanceolata* and *B. rupicola*, were part of a strongly supported clade (= *Boronia* subsect. *Grandisepalae*). *Boronia anomala* has two of the synapomorphies of *Boronia* subsect. *Grandisepalae*, viz. distinctly clavate staminal filaments and antepetalous anthers that are much larger than the antesealous anthers, but it lacks the relatively large sepals and the prominent ridge on the dorsal side of the seed.

To determine the phylogenetic position of *B. anomala* the species was scored for the data set that contained all known species of *Boronia* sect. *Valvatae* that were analysed by Duretto and Ladiges (1999). Sepal aestivation was scored as unknown. Due to the sensitivity of the *Boronia* subsect. *Valvatae* clade to additions and deletions of characters and taxa (see Duretto and Ladiges 1999) an exemplar set of taxa to represent each species group in that subsection was included: viz. *B. ledifolia*, *B. eriantha*, *B. granitica*, *B. rupicola*, *B. fraseri*, *B. keysii*, *B. rosmarinifolia*, *B. splendida*, *B. foetida*, *B. bella*, *B. obovata*, *B. alulata*, *B. quinkanensis*, *B. duiganiae*, *B. odorata* and *B. lanceolata*. The data set was analysed using PAUP 3.1.1 (Swofford 1993) and *Boronia* sect.'s *Alatae* and *Algidae* were used as outgroups.

Preliminary results (unpub. data) were inconclusive as the position of *B. anomala* was not resolved with respect to the four subsections of *Boronia* sect. *Valvatae*. *Boronia anomala* was sister to *Boronia* subsect. *Grandisepalae* in 80% of the 2059 most parsimonious trees found. Alternatively *B. anomala* was either sister to *Boronia* sect.

*Valvatae* (10% of trees) or *Boronia* subsect. *Bowmaniae*. These results are repeated (almost exactly, with 2060 equally parsimonious trees) when the sepals of *B. anomala* are scored as being valvate. When sepal aestivation of *B. anomala* is scored as being imbricate, *B. anomala* is sister to *Boronia* sect. *Valvatae* in all of the 210 most parsimonious trees. Given the uncertain position of *B. anomala* in the above analysis it is treated here as being *incertae sedis* in *Boronia* sect. *Valvatae*.

It is possible that *B. anomala* is a basal member of *Boronia* subsect. *Grandisepalae*. If this is so, then it would indicate the order of character evolution in this subsection: viz. the evolution of the constricted staminal filament ends and relatively large antepetalous anthers preceded the evolution of the relatively large sepals and the dorsal ridge of the seed. This hypothesis, and the placement of *B. anomala*, as presented here, will be tested in a forthcoming cladistic analysis of *Boronia* and its allies. Given the unusual combination of character states found in *B. anomala*, it is possible, with more data and further research, that a new section will need to be described to accommodate this most unusual species.

*Distribution and ecology:* *Boronia anomala* is known from a sandstone gorge near Kalumburu, eastern Kimberley, Western Australia (Fig. 1). The only known population occurs under an overhang surrounded by heath dominated by *Triodea burbridgeana* (B. Harwood, DNA, pers. comm.). Flowering and fruiting material has been collected in June.

*Conservation Status:* A ROTAP code of 2V is appropriate for this species. Further field work is urgently needed to determine the extent of the known population and if there are any other populations.

*Etymology:* The specific epithet is derived from Latin *anomalus* (diverging from the usual, abnormal). The name refers to the unusual combination of characters found in this species, and that it is atypical of *Boronias* in the Kimberley Region in not having sepals that are much smaller than the petals.

***Boronia* sect. *Valvatae* subsect. 1. *Ternatae* Duretto, subsect. nov.** Pili stellati apressi.

Folia trifoliolata vel simplicia; epidermis crystallis constatis e cera dispesis. Semina tristia, reniformia. *Sp. typica:* *B. ternata* Endl.

*Branches* eglandular, terete to slightly quadrangular. Stellate hairs sessile; all rays appressed, unfused, smooth, firm, white. *Leaves* trifoliolate, rarely unifoliolate (*B. ternata*), firm, scattered wax platelets on epidermis; the midrib not raised on the abaxial surface, spongy mesophyll continuous under midvein or absent, the midrib not impressed on the adaxial surface. Inflorescence 1(–3)-flowered; peduncle deciduous with flower; prophylls minute or minutely unifoliolate. Sepals shorter and narrower than petals, rarely the same size (*B. adamsiana*). Petals pink or white, with firm, shiny stellate hairs on the abaxial surface, the midrib sometimes raised on the abaxial surface. Filaments capitate, tapering apex, antepetalous filaments slightly glandular distally; anthers attached to the apex of the filament, all equal. Disc entirely within stamen whorl or just surrounding base of filaments. *Seeds* reniform, adaxial side without ridge, dull, black to grey; tubercles roughly textured, unfused.

All four species of *Boronia* sect. *Valvatae* that are found in south-western Australia (Fig. 3) are placed in *Boronia* subsect. *Ternatae*. The subsection is characterised by scattered epicuticular wax platelets on the usually trifoliolate leaves, and the dull and reniform seeds. There are two series.

***Boronia* sect. *Valvatae* subsect. *Ternatae* Duretto ser. 1. *Ternatae***

*Leaflets* elliptic to oblanceolate, obtuse, plane, concolourous, isobilateral, glabrous or

with a moderately dense to dense stellate indumentum. *Style* glabrous to hirsute for full length.

The two species of this series, with some exceptions (see below), are found primarily on the sandplains of the wheatbelt, and have leaves that are plane and concolourous.

6. *Boronia ternata* Endl., *Nov. stirp. dec.* 1: 6 (1839). *Type citation*: "Novae-Hollandiae austro-occidentalis interioribus legit cl. Roe". *Type*: N.H.a.O., Roe *s.n.* (holotype W n.v. (photographs MEL 2049262, NSW, PERTH)).

Erect, much branched *shrub* to 2 m tall. Multiangular stellate hairs with c. 4–25 rays; rays 0.05–0.5 mm long. Branches terete to quadrangular, with a sparse to dense indumentum, becoming glabrous as they age, the hair density even or rarely greater between the decurrent leaf bases though these are rarely present. *Leaves* trifoliate or unifoliate, firm, sessile or petiolate; petiole to 2 mm long, slightly winged; leaflets elliptic to oblanceolate, obtuse or rarely acute (mainly on juvenile foliage) or deeply emarginate, attenuate, glabrous or with a moderately dense to dense indumentum; terminal leaflet 2–15 mm long, 1–5.5 mm wide; lateral leaflets 2–12 mm long, 1–4 mm wide. *Inflorescence* with a dense, stellate indumentum; peduncle 0.5–4 mm long; prophylls 0.5–2 mm long, indumentum as with leaves; metaxyphylls 0.5–1 mm long; anthopodium 0.5–10 mm long. Sepals elliptical or ovate-deltate or lanceolate, 2–3.5 mm long, 1–2.5 mm wide, acute to acuminate, not enlarging significantly as fruit matures; adaxial surface glabrous or glabrescent or with a sparse to moderately dense indumentum at tip; abaxial surface with a sparse to dense, stellate indumentum. Petals 4–11 mm long, 2–6 mm wide, enlarging slightly as fruit matures; adaxial surface with a sparse to dense indumentum distally, becoming glabrous towards the base; abaxial surface with a moderately dense to dense stellate indumentum, sometimes abaxial surface with a prominently raised midrib. Filaments glabrescent or with many stiff simple or rarely bifid hairs; antesealous filaments 1.5–2 mm long, prominently glandular on the distal 0.5 mm; antepetalous filaments 1–1.5 mm long; abaxial surface of anther not frosty; anther-apiculum large, reflexed, rarely absent. *Cocci* 3–5.5 mm long, 2–3.5 mm wide, with a sparse to dense simple and/or stellate indumentum. Seed 2.5–4 mm long, 1.5–2.5 mm wide.

*Notes*: *Boronia ternata* differs from *B. adamsiana* by having sepals that are much shorter than the petals, and smaller hairs (Figs 4a–d). The quinolene alkaloids of *B. ternata* are similar to those of *B. lanceolata* (Ahson *et al.* 1993), the only two members of *Boronia* sect. *Valvatae* studied. Stace *et al.* (1993) report that the chromosome number for *B. ternata* is  $n=9$ . No specimens were cited, so it is not known which variety was studied.

*Boronia ternata* has six varieties and intergradation between varieties appears to occur in some areas, for example north of, and in the eastern parts of Fitzgerald River N.P., and in the Bendering Reserve/Nyabing area.

*Distribution and ecology*: *Boronia ternata* occurs mainly on the sand plains between Eneabba, Kalgoorlie and Esperance, south-western Western Australia (Fig. 3), where it is found in mallee and heath on sands, laterites, and spongelite. Flowering: April–November; fruiting May–January.

### Key to varieties

1. Leaves with a dense indumentum, though the hairs are sometimes minute, juvenile foliage with a sparse to dense indumentum; rarely the leaves and flowers glabrous.
2. Anthopodium (pedicel) 0.5–1 mm long; adult leaves with a very dense indumentum, epidermis not visible under magnification; the leaves and flowers rarely glabrous

.....6a. var. *ternata*

2. Anthopodium (pedicel) greater than 2 mm long; adult leaves with a moderately dense indumentum, the margins often glabrous, epidermis visible under magnification; flowers hirsute.
3. Leaves obviously hirsute, the margins hirsute; filaments with simple hairs; styles hirsute.....**6b. var. promiscua**
3. Leaves appearing glabrous and slightly glaucous but actually covered with minute hairs, the margins often glabrous; filaments with simple and bifid hairs; styles glabrous..... **6f. var. austrofoliosa**
1. Leaves glabrous or glabrescent; flowers always hirsute
  4. Anthopodium (pedicel) 4–10 mm long, at least 1/2 length of leaves; petals 6–11 mm long; style hirsute.....**6c. var. elongata**
  4. Anthopodium (pedicel) to 2 mm, less than 1/2 length of leaf, rarely to 5 mm long (Bendering Reserve); petals 4–6 mm long; style glabrous.
  5. Leaflet apex usually deeply emarginate; leaves predominantly trifoliolate; sepals 1.5–2 mm long.....**6d. var. glabrifolia**
  5. Leaflet apex always obtuse; leaves predominantly simple; sepals 2.5–3 mm long .  
.....**6e. var. foliosa**

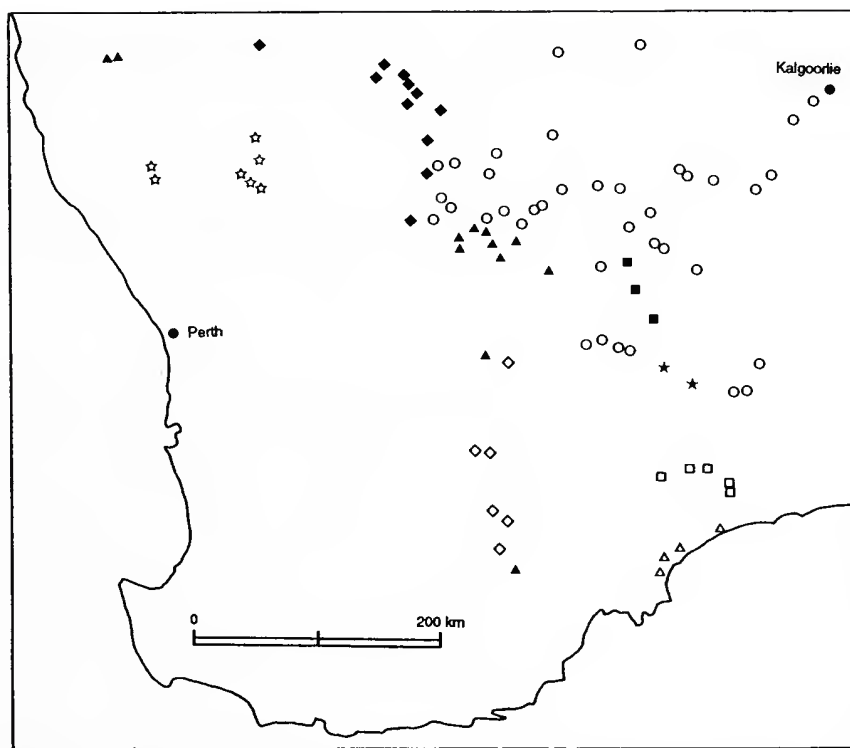
**6a. *Boronia ternata* Endl. var. *ternata***

*Illustration:* M.G. Corrick and B.A. Fuhrer, *Wildflowers of Southern Western Australia*, 192, fig. 652 (1996).

*Shrub* to 2 m tall, with a hoary, stellate tomentum on branches and adult leaves, or rarely glabrous. Multiangular stellate hairs with rays 0.1–0.3(–0.5) mm long (Fig. 4a). Branches terete to slightly quadrangular, the hair density even, decurrent leaf bases absent. *Leaves* sessile, trifoliolate, though younger distal leaves often becoming unifoliolate; leaflets elliptic to oblanceolate, obtuse or rarely acute (mainly on juvenile foliage); terminal leaflet usually slightly longer than laterals; leaflets and unifoliolate leaves 2–12 mm long, 1–4 mm wide; juvenile, proximal leaves glabrous, the density of the indumentum increasing with each node until leaves have a dense indumentum. *Inflorescence* 1-flowered; peduncle 0.5–1 mm long; prophylls 0.5–1 mm long; metaxephylls to 0.5 mm long; anthopodium 0.5–1 mm long. Sepals elliptical, 2–3 mm long, 1–1.5 mm wide, acute; abaxial surface with a moderately dense to dense stellate indumentum. Petals 4–5 mm long, 2–3 mm wide. Filaments pilose; antesealous filaments 1.5–2 mm long; antepetalous filaments 1–1.5 mm long; anther-apiculum large, reflexed, or absent. Disc entirely within stamen whorl. Style glabrous to hirsute for full length. *Cocci* c. 5 mm long, c. 3 mm wide, with a moderately dense indumentum. Seed 3–3.5 mm long, c. 2.5 mm wide.

*Selected specimens examined (of c. 80 collections):* WESTERN AUSTRALIA: EREMAEAN BOTANICAL PROVINCE: COOLGARDIE DISTRICT: 9 km NW of Stewart, c. 45 km WNW of Coolgardie, K. Newby 8700, 26.viii.1981 (PERTH); 50 km E of Yellowdine, 31°14'S 120°12'E, M.F. Duretto 182-189 and M. Bayly, 19.viii.1992 (MFD182-185, 187, 188: MEL; MFD186: CANB, MEL); Yellowdine, 31°18'S 119°39'E, R.J. Cranfeild 701, 20.ix.1978 (PERTH); 50 km E of Yellowdine, 31°14'S 120°12'E, L.A. Craven 7460, 2.ix.1982 (CANB, MEL, PERTH); 4 km E of rest area, c. 96 km E of Yellowdine on Great Eastern Hwy, c. 31°10'S 120°32'E, M.F. Duretto 190 and M. Bayly, 19.viii.1992 (BRI, HO, MEL, PERTH); Deborah Lake, Mr. Cronin, 1893 (MEL); 11 km WSW of Boorabbin, c. 77 km E of Southern Cross, K. Newby 5721, 20.viii.1979 (PERTH); Southern Cross-Forresteria Rd, 8.3 km SSE of Marvel Loch, 31°30'40"S 119°52'10"E, F.H. Mollemans 2565, 23.v.1990 (AD); Bronti, 242 miles E of Perth, R. Melville 163 & C.A. Gardener, 5.viii.1952 (MEL, NSW, PERTH); c. 50 km SW of Coolgardie, 5 km SW of Queen





**Fig. 3.** Distribution of *Boronia* subsect. *Ternatae* series *Ternatae*: *B. ternata* var. *ternata* (O), *B. ternata* var. *promiscua* (■), *B. ternata* var. *elongata* (□), *B. ternata* var. *glabrifolia* (Δ), *B. ternata* var. *foliosa* (▲), *B. ternata* var. *austrofoliosa* (◇), *B. adamsiana* (◆); series *Ericifoliae*: *B. ericifolia* (☆), *B. revoluta* (★).

Victoria Rock, 31°20'S 120°54'E, *J. Taylor 591*, *M.D. Crisp* and *R. Jackson*, 18.ix.1979 (CANB, PERTH); Bending, *C.A. Gardner 1989*, 26.viii.1923 (PERTH); 2 miles W of Moorine Rock, *D. Butcher 15*, 21.iv.1978 (PERTH); SOUTH-WEST PROVINCE: AVON DISTRICT: 3 km W of Bodallin, 31°27'S 118°48'E, *R.J. Cranfield 1517*, 18.vii.1980 (AD, BRI, CANB, MEL, NSW, PERTH); Between Burracoppin and Moorine Rock, c. 20 km from Southern Cross, *Dr. J.S. Beard 6214*, 18.ix.1970 (NSW, PERTH); 35 km W of Southern Cross on Great Eastern Hwy, Noongar, 31°20'E 118°58'S, *M.D. Crisp 6573*, 19.vii.1980 (AD, MEL); Chiddacooping, 8 miles N of Warrachuppin, near gravel pit on East boundry, 30°54'S 118°41'E, *B.H. Smith 584*, 17.vi.1985 (CANB, MEL, PERTH); c. 10 E of Mukinbudin, *B. Dell 123*, 25.ix.1972 (PERTH); ROE DISTRICT: 16 miles N of Golt Rock on the road to Emu Rock E of Hyden, 32°24'S 119°18'E, *B.R. Maslin*, 14.vii.1970 (CANB); Frank Hann NP, *Butcher 330*, 7.viii.1978 (CANB, MEL, NSW, PERTH).

*Notes:* *Boronia ternata* var. *ternata* is the most common and widespread variety of *B. ternata* and inhabits more arid areas than the other varieties. Glabrous plants of var. *ternata* have been collected at Yellowdine (e.g., *Cranfield 701*, *Craven 7460* [MEL, PERTH]) as have the hirsute typical forms (*Craven 7460* [CANB]; *Duretto 182-9*). The developmental sequence in indumentum density, from glabrous to dense, does happen over very few nodes (e.g., *Melville 163*) and the glabrous specimens cited above are large. Detailed field work would be required in the Yellowdine area to ascertain if these specimens were sports or represent an unusual population.

*Distribution and ecology:* *Boronia ternata* var. *ternata* occurs between Mukinbudin and



Bonnie Rock to Kalgoorlie and Frank Hann N.P., Western Australia (Fig. 3), where found in heath and mallee woodland on sand.

*Conservation status*: Common, widespread and found in various reserves: not under threat.

- 6b. *Boronia ternata* var. *promiscua*** Duretto, var. nov. Differt a varietate typica indumento foliorum denso modice ubique, anthopodis longioribus (2–5 mm longis).  
*Type*: 13.8 km N from Hyden turnoff along Hatters Hill-Southern Cross Rd, 32°18'S 119°45'E, M.F. Duretto 223 and M. Bayly, 22.viii.1992 (holotype MEL 2029643; isotypes CANB, K, MEL 2038869, NSW, PERTH).

*Shrub* to 1.5 m tall, with a hoary, moderately dense to dense stellate tomentum on branches and leaves. Multiangular stellate hairs with rays to 0.1(–0.5) mm long (Fig. 4b). Branches terete to slightly quadrangular, hair distribution even, decurrent leaf bases absent. *Leaves* unifoliate, oblanceolate, obtuse, sessile, 5–14 mm long, 2–3 mm wide. *Inflorescence* 1-flowered; peduncle to 1 mm long; prophylls 0.5–2 mm long; metaxyphylls 0.5–1 mm long; anthopodium 2–5 mm long. Sepals lanceolate, acute to acuminate, 2–3.5 mm long, 1–2.5 mm wide; abaxial surface with a moderately dense stellate indumentum. Petals 5–6 mm long, 2.5–3 mm wide. Filaments pilose; antesepalous filaments 1.5–2 mm long; antepetalous filaments 1–1.5 mm long; anther-apiculum large, reflexed. Disc entirely within staminal whorl or sometimes surrounding base of filaments. Style hirsute for full length. *Cocci* c. 5.5 mm long, c. 2.5 mm wide, with a moderately dense to dense indumentum. Seed 2.5–3 mm long, 1.5–2 mm wide.

*Additional specimens examined*: WESTERN AUSTRALIA; SOUTH-WEST BOTANICAL PROVINCE; ROE DISTRICT: 13.8 km N from Hyden turnoff along Hatters Hill-Southern Cross Rd, 32°18'S 119°45'E, M.F. Duretto 221–222, 223a–225 and M. Bayly, 22.viii.1992 (MFD221: CANB, MEL, NSW, PERTH; MFD221a: AD, BRI, MEL, NSW, PERTH; MFD222, 224: MEL; MFD223a: CANB, MEL, PERTH; MFD225: MEL, PERTH); 9 miles S of Mt Holland, K. Newby 1121, 14.x.1963 (PERTH); 15.4 km N of Mt Holland turn off on Southern Cross-Forrestania Rd and 1.5 km along the gridline, 32°03'20"S 119°38'20"E, F.H. Mollemans 2670, 25.v.1990 (PERTH); ENE of Parker Range S, a track junction on way to Southern Cross-Forrestania Rd, 14.7 km E of Skeleton Rocks and 75 km SSE of Southern Cross, 31°51'10"S 119°37'02"E, F.H. and M.P. Mollemans 2760, 15.vi.1990 (PERTH); Near Mine Camp, Bounty Mine, N of Mt Holland, 32°07'S 119°47'E, G. Barrett 642, 7.ix.1994 (PERTH); 7.7 miles N of Lake King-Norseman track on track to Southern Cross, C. Stacey 60, 25.ix.1971 (PERTH).

*Distribution and ecology*: *Boronia ternata* var. *promiscua* occurs over a small area south of Southern Cross near Mt Holland, Western Australia (Fig. 3), where it is found growing on sand and laterites in disturbed areas in woodland.

*Conservation status*: For now, a ROTAP code of 2R is appropriate. To assess the status of this variety surveys are required to ascertain population sizes and extent.

*Etymology*: The epithet is derived from the Latin, *promiscuus* (mixed), and alludes to the mixture of character states found in this taxon that are typical for other varieties: the dense indumentum of var. *ternata*, the long pedicels of var. *elongata*, and the narrow leaflets of var. *foliosa*.

- 6c. *Boronia ternata* var. *elongata*** Paul G. Wilson, *Nuytsia* 1: 201 (1971). *Type*: N side of Mt Short, 14 km NNW of Ravensthorpe, 33°28'S 120°00'E, P.G. Wilson 6932, 8.viii.1968 (holotype PERTH 1610287; isotypes B n.v., K n.v., MEL 243036).

*Illustration*: M.G. Corrick and B.A. Fuhrer, *Wildflowers of Southern Western Australia*, 192 fig. 653 (1996).

*Shrub* to 2 m tall. Multiangular stellate hairs with rays to 0.1 mm long. Branches terete to slightly quadrangular, with a sparse to dense, stellate indumentum, pubescence denser between the decurrent leaf bases (when present). *Leaves* trifoliolate or unifoliolate, oblanceolate, obtuse or rarely deeply emarginate, glabrous or glabrescent, sessile or petiolate; petiole to 2 mm long; terminal leaflet same size or longer than laterals, 3–12 mm long, 2–5.5 mm wide; lateral leaflets 3–7 mm long, 1.5–3 mm wide; unifoliolate leaves 5–12 mm long, 2–5 mm wide. *Inflorescence* 1(–3)-flowered, with a dense indumentum; peduncle 0.5–4 mm long; prophylls to 0.5 mm long; metaxyphylls c. 0.5 mm long; anthopodium 4–10 mm long. Sepals ovate-deltate, acute, 2–3 mm long, 1–1.5 mm wide; abaxial surface with a dense, stellate indumentum. Petals 6–11 mm long, 3–6 mm wide. Filaments pilose; antesealous filaments 1.5–2 mm long; antepetalous filaments 1–1.5 mm long; anther-apiculum large, reflexed. Disc sometimes surrounding base of filaments. Style hirsute for full length. *Cocci* 3.5–5 mm long, 2.5–3 mm wide, with a moderately dense indumentum. Seed 2.5–4 mm long, 1.5–2 mm wide.

*Selected specimens examined* (of c. 30 collections): WESTERN AUSTRALIA: SOUTH-WEST BOTANICAL PROVINCE: EYRE DISTRICT: Mt Short, gravel pit, 2.3 km along Mt Short Rd from Ravensthorpe to Lake King Rd, 33°28'S 120°00'E, *M.F. Duretto* 202-207 and *M. Bayly*, 21.viii.1992 (*MFD202*: CANB, MEL, NSW, PERTH; *MFD203*: BRI, CANB, MEL, PERTH; *MFD204*: CANB, MEL, PERTH; *MFD205*: CANB, MEL, NSW, PERTH; *MFD206*: MEL, PERTH, NSW; *MFD207*: MEL); Ravensthorpe Ra., 8 km N of Ravensthorpe, *P.G. Wilson* 7102, 13.viii.1968 (PERTH); Gravel pit c. 3 km E of Lake King/Ravensthorpe Rd on Mt Short Rd, 33°27'20"S 119°50'30"E, *B. and B. Backhouse H/18*, 12.ix.1990 (PERTH); Mt Desmond, 2.3 km along Everton Rd towards Esperance from Ravensthorpe-Hopetown Rd, 33°37'S 120°09'E, *M.F. Duretto* 194-198 and *M. Bayly*, 21.viii.1992 (*MFD194*: CANB, MEL, PERTH; *MFD195*: MEL, NSW; *MFD196*: MEL; *MFD197*: CANB, MEL, NSW; *MFD198*: MEL, PERTH); 1 km E of Mt Desmond summit, Ravensthorpe area, 33°37'S 120°09'E, *B. Barnsley* 448, 9.i.1979 (CANB); 2.3 km along the road to Esperance from the Ravensthorpe to Hopetown Rd (turnoff for Esperance is 10 km S of Ravensthorpe), 33°39'S 120°09'E, *P.S. Short* 2704, *M. Amerena*, *B.A. Fuhrer*, 4.viii.1986 (AD, PERTH); Elverdton Rd, 3 km from junction with Ravensthorpe-Hopetown Rd, SE of Ravensthorpe, 33°37'S 120°09'E, *M.G. Corrick* 9574, 27.ix.1985 (MEL); 1 mile E of Elverdton Mine, Ravensthorpe, *K. Newby* 2602, 16.vii.1967 (PERTH); Corner of West River Rd and Fitzgerald River Rd NW of Ravensthorpe, *A.C. Carmichael*, 28.viii.1982 (PERTH); 28 km W of Ravensthorpe and 12 km N of Ravensthorpe-Ongerup Rd, *P.G. Wilson* 7126, 14.viii.1968 (PERTH).

*Notes*: It is of interest to note that specimens from Mt Short are predominantly unifoliolate, while those from Mt Desmond are predominantly trifoliolate though this variation does not appear to warrant taxonomic recognition. A specimen intermediate between these two varieties has been collected just north of Fitzgerald River N.P. (*Carmichael*, 28.viii.1982, PERTH) that has short peduncles like var. *foliosa* but large flowers like var. *elongata*. No plants of *B. ternata* could be located at that locality in 1992. This specimen is here included within the concept of *B. ternata* var. *elongata*.

*Distribution and ecology*: *Boronia ternata* var. *elongata* is restricted to small populations north and south of Ravensthorpe, centred around Mt Short and Mt Drummond, Western Australia (Fig. 3), where found on laterites in open woodland or heath.

*Conservation status*: As this variety is known from few populations and has been collected from Fitzgerald River N.P., a ROTAP code of 2RC- is appropriate.

**6d. *Boronia ternata* var. *glabrifolia*** F. Muell., *Fragm.* 11: 111 (1875). *Type citation*: "Cl. Maxwell hanc varietum ad Middle and East Mount Barren reperit." *Type*: Coast ranges, Middle and E. Mt Barren, *G. Maxwell* (holotype MEL 249149).

*Boronia calophylla* Turcz., *Bull. Soc. Imp. Naturalistes Moscou* 2: 160 (1852). *Type citation*: no specimens cited (see below). *Type*: W.A., *Drummond 5th Coll.* n205 (syntypes K n.v. (photograph AD 99548076), MEL 249150, TCD).

*Shrub* to 1 m tall. Multiangular stellate hairs with rays to 0.1(–0.5) mm long. Branches terete to slightly quadrangular, with a moderately dense stellate indumentum, decurrent leaf bases absent. *Leaves* trifoliolate or rarely unifoliolate, glabrous or glabrescent; petiole 0.5–1 mm long; leaflets oblanceolate, the apex usually deeply emarginate; terminal leaflet shorter than laterals, 2–5 mm long, 1–3 mm wide; lateral leaflets and unifoliolate leaves 2–6 mm long, 1–4 mm wide. *Inflorescence* 1-flowered, with a moderately dense to dense stellate indumentum; peduncle 0.5–1 mm long; prophylls to 0.5 mm long; metaxyphylls minute; anthopodium 1.5–3.5 mm long. Sepals ovate-deltate, acute, 1.5–2 mm long, c. 1 mm wide; abaxial surface with a moderately dense stellate indumentum. Petals 4–6 mm long, 2–3 mm wide. Filaments with few stiff, simple hairs; antesealous filaments c. 2 mm long; antepetalous filaments c. 1.5 mm long; anther-apiculum large, reflexed. Disc sometimes surrounding base of filaments. Style glabrous. *Cocci* with a sparse to moderately dense indumentum (mature fruit not seen). Mature seed not seen.

*Additional specimens examined*: WESTERN AUSTRALIA; SOUTH-WEST BOTANICAL PROVINCE; EYRE DISTRICT: Fitzgerald R., C.A. *Gardener* 9216, 22.ix.1948 (MEL, PERTH); Near Mt Bland in Fitzgerald River reserve, 34°12'S 119°28'E, P.G. *Wilson* 10154, 6.x.1970 (AD, CANB, PERTH); Fitzgerald River reserve, stony cliffs on western edge of river valley, 34°12'S 119°28'E, R.D. *Royce* 8894, 12.vii.1970 (PERTH); Near Fitzgerald R., Fitzgerald River NP, on well exposed breakaway rims, K. *Newbey* 3309, 24.x.1970 (PERTH); Fitzgerald R. area, c. 70 miles (112.7 km) ESE of Ongerup, T.E.H. *Aplin*, I. *Lethbridge* and R. *Conveny* 3200, 8.ix.1970 (NSW); W of lower Fitzgerald R., Fitzgerald River Reserve, 34°5'S 119°31'E, A.S. *George* 9932, 12.vii.1970 (PERTH); Fitzgerald River Reserve, R.D. *Royce* 8921, 12.vii.1970 (PERTH); Flumen Fitzgerald inferum, C.A. *Gardner* 14750, 5.v.1964 (PERTH).

*Typification*: A single collection was cited in the protologue of var. *glabrifolia*. A specimen matching the locality information but without collectors details has been located at MEL. The handwriting of the locality data matches that of G. Maxwell (handwriting samples, MEL) and so, this specimen is confidently identified as the holotype.

Turczaninow (1852) did not cite any material when describing *B. calophylla* but it can be assumed it was a Drummond collection (J. Ross, pers. comm.) Bentham (1863) cites only one collection of *B. calophylla*, a Drummond collection (W.A. *Drummond 5th Coll.* n205). It is thus highly likely that this collection is the one Turczaninow worked from and a specimen matching these details have been located at K, MEL, and TCD.

*Notes*: *Boronia ternata* var. *glabrifolia* is a poorly collected variety that may grade into var. *elongata* in the eastern part of its range. It can be distinguished from this later variety by its smaller, obcordate leaflets, and its smaller inflorescence and floral parts. Spheroidal sclereids have been reported for *B. calophylla* (Rao and Bhattacharya 1978, 1981).

*Distribution and ecology*: *Boronia ternata* var. *glabrifolia* is restricted to the Fitzgerald River N.P. area between Bremer Bay and Hopetoun, Western Australia (Fig. 3), where found in heath and woodland on spongolite or granite.

*Conservation status*: Though restricted in distribution the variety is found entirely within Fitzgerald River N.P.: a ROTAP code of 2RC- is appropriate.

- 6c. *Boronia ternata* var. *foliosa* (S. Moore) Paul G. Wilson, *Nuytsia* 1: 201 (1971).  
*Boronia foliosa* S. Moore, *J. Linn. Soc. London, Bot.* 45: 165 (1920). *Type citation*:



“Bruce Rock; *Stoward 334*. Totadjen, *Id. 356*. Nungarin, *Id. 412*.” Type: Bruce Rock, *F. Stoward 334* (isosyntype MEL 707566 (drawing PERTH 1610279)); Totadjen, *Stoward 356* (n.v.); Nungarin, *Stoward 412* (n.v.).

*Shrub* to 1 m tall. Multiangular stellate hairs with rays to 0.1 mm long. Branches slightly to strongly quadrangular, with a sparse to moderately dense stellate indumentum, often concentrated between the decurrent leaf bases. *Leaves* trifoliolate or unifoliolate, sessile or petiolate; petiole to 1 mm long; leaflets and unifoliolate leaves elliptic to oblanceolate, obtuse, glabrous to glabrescent; leaflets and unifoliolate leaves c. all equal in size, 3–15 mm long, 1–5 mm wide. *Inflorescence* 1(–3)-flowered, with a dense, stellate indumentum; peduncle 1–1.5(–5) mm long; prophylls 0.5–1 mm long; metaxyphylls to 0.5 mm long; anthopodium 1.5–2(–5) mm long. Sepals ovate-deltate to lanceolate, acute to slightly acuminate, 2.5–3 mm long, 1–1.5 mm wide; abaxial surface with a moderately dense to dense stellate indumentum. Petals 4–6 mm long, 3–4 mm wide. Filaments pilose; antesepalous filaments 1.5–2 mm long; antepetalous filaments 1–1.5 mm long; anther-apiculum large, reflexed. Disc entirely within stamen whorl. Style glabrous. *Cocci* 3–4 mm long, 2–3 mm wide, with a moderately dense indumentum. Mature seed not seen.

*Selected specimens examined (of c. 50 collections)*: WESTERN AUSTRALIA; SOUTH-WEST BOTANICAL PROVINCE; IRWIN DISTRICT: 14 miles W of Windsor, 29°46'S 115°45'E, *Mr. Chapman*, 13.viii.1972 (CANB, MEL, PERTH); 27.7 km W of Carnamah turnoff on the southern road verge of the Eneabba-Carnamah Rd, 29°46'S 115°40'E, *M.F. Duretto 167* and *M. Bayly*, 15.viii.1992 (MEL, NSW, PERTH, WAU); AVON REGION: 15 km E of Merredin on Great Eastern Hwy opposite microwave repeater station, 31°27'S 118°28'E, *M.F. Duretto 178-181* and *M. Bayly*, 18.viii.1992 (*MFD178*: AD, CANB, MEL, PERTH, NSW; *MFD179-181*: MEL); c. 8 km SW of Merredin on road to Bruce Rock, 31°33'S 118°14'E, *N.N. Donner 4587*, 6.ix.1973 (AD, CANB, PERTH); 1.7 miles [2.7 km] W of Merredin, 31°29'S 118°16'E, *M.D. Tindale 3728*, 27.viii.73 (CANB, MEL, NSW, PERTH); 5 miles N of Muntadgin, edge of Brownbunk Flats and sandplain, *E.T. Bailey 256*, viii.1945 (PERTH); Bendering Reserve A 20338, 23 km NNE of Kondin, *B.G. Muir 425*, 2.vi.1975 (PERTH); Nungarin, *R.D. Royce 6656*, 12.ix.1961 (PERTH); c. 24 km SSE of Carrabin (NNE of Noombenderry Rock) Flora and Fauna Reserve on land survey blocks 969 and 975, 31°36'S 118°50'E, *A. Strid 20511*, 15.ix.1982 (PERTH); 2.6 miles S of Bendering to Kondinin, *M.I.H. Brooker 2646*, 13.vii.1970 (PERTH); Nyabing-Ongerup Rd., *F.W. Humphreys 2*, 29.vi.1966 (PERTH); 17 miles SE of Nyabing, *N. Newbey 1146*, 14.x.1963 (PERTH); Between Boorham and Burracoppin, *H.F. and M. Broadbet 1588A* (PERTH); N of Borden, 110 km NNE of Albany, *A.M. Ashby 1605*, 25.viii.1965. (AD, PERTH); Meranda North Rd, 33.8 km W of Emu Fame Rd, 49.2 km SW of Southern Cross, 31°49'35"S 118°57'55"E, *F.H. and M.P. Mollemans 2784*, 16.vi.90 (CANB); Bruce Rock, *Stoward 319* (BM n.v., transparency MEL); Totadjen, *Stoward 335*, 1916 (BM n.v., transparency MEL).

*Typification*: Three collections were cited in the protologue of *B. foliosa* (viz., Bruce Rock, *F. Stoward 334*; Totadjen, *Stoward 356*; Nungarin, *Stoward 412*). Of these, only a Bruce Rock specimen (*Stoward 334*, MEL) has been seen, this specimen was called an isosyntype by Wilson (1971). No lectotype will be designated until more material comes to hand

*Notes*: Moore (1920) wrote that this taxon was closely related to *B. crassipes* Bartl. (*Boronia* sect. *Boronia* s. lato). Superficially these taxa are similar, both with plane, glabrous and usually simple leaves, but *B. ternata* var. *foliosa* clearly belongs with *B. ternata* in *Boronia* sect. *Valvatae*.

Specimens from Bendering Reserve (*Brooker 2646*, *Muir 425*) have longer peduncles and anthopodia (4–5 mm) than typical var. *foliosa*, but the sepals and petals are similar in size to that of typical *foliosa* and are referred to this taxon. A specimen from north of

Fitzgerald River NP (Carmichael, 28.viii.1982, PERTH) is intermediate between vars *foliosa* and *elongata* (see *Notes* under var. *elongata*).

*Distribution and ecology*: *Boronia ternata* var. *foliosa* occurs mainly around Merredin and Bruce Rock, with disjunct populations to the northwest near Eneabba and Winchester, and to the south near Borden, Western Australia (Fig. 3). It is found growing in heath or low woodland on sand and laterite.

*Conservation status*: Though widely collected, populations are small, localised and threatened with local extinction (pers. obs.). A ROTAP code of 3R may be appropriate but further surveys are required to confirm this.

**6f. *Boronia ternata* var. *austrofoliosa*** Duretto, var. nov. Differt a varietate typica indumento foliorum modice denso constato e pilus minutis, margo glabro. *Type*: Tarin Rock Reserve, along the fenceline on the western side, 33°06'S 118°12'E, D.E. Albrecht 4134 and B.A. Fuhrer, 31.viii.1990 (holotype MEL 2013856; isotype PERTH 2933284).

*Boronia ternata* var. *foliosa* sensu Corrick and Fuhrer (1996, p. 192).

*Illustration*: M.G. Corrick and B.A. Fuhrer, *Wildflowers of Southern Western Australia*, 192, fig. 654 (1996, as *Boronia ternata* var. *foliosa*).

*Shrub* to 1 m tall. Multiangular stellate hairs with rays to 0.1(–0.2) mm long. Branches slightly to strongly quadrangular, with a dense, stellate indumentum, decurrent leaf bases present. *Leaves* unifoliate, sessile or petiolate; petiole to 0.5 mm long; lamina elliptic to oblanceolate, obtuse, 5–10 mm long, 3–4 mm wide, with a moderately dense stellate indumentum (Fig. 4c), often glabrous along the margins. *Inflorescence* 1-flowered, with a dense stellate indumentum; peduncle 0.5–1 mm long; prophylls 1–1.5 mm long; metaxyphylls 0.5–1 mm long; anthopodium 2–3 mm long. Sepals elliptical, acute, 2–2.5 mm long, 1–1.5 mm wide; abaxial surface with a moderately dense stellate indumentum distally. Petals 4–6.5 mm long, 2.5–4.5 mm wide. Filaments with many stiff, simple or bifid hairs; antesealous filaments c. 1.5 mm long; antepetalous filaments c. 1 mm long; anther–apiculum large, reflexed. Disc entirely within stamen whorl. Style glabrous. *Cocci* 4–4.5 mm long, c. 3 mm wide, with a moderately dense to dense indumentum. Mature seed not seen.

*Additional specimens examined*: WESTERN AUSTRALIA; SOUTH-WEST BOTANICAL PROVINCE; ROE DISTRICT: 29.4 km W of Lake Grace, 10–100 m E of Air Navigation Tower, M.F. Duretto 229–234 and M. Bayly, 23.viii.1992 (MEL); Nyabing, SW of Lake Grace, Mr McDougal 4, 1949 (MEL); 11 miles from Kukerin towards Lake Grace (200 mile post) J.W. Wrigley, 9.xi.1968 (CANB); 28 km W of Lake Grace, Tarin Rock Reserve, 33°05'S 118°05'E, J.M. Brown 303, 2.x.1984 (PERTH); W of Lake Grace, D and P Nevin, 6.ix.1970 (PERTH); W of Lake Grace, D and P Nevin, 6.ix.1970 (PERTH); 17.5 miles W of Lake Grace, A.S. George 347, 13.ix.1959 (AD, PERTH); Tarin Rock, W of Lake Grace, c. 275 km SE of Perth, A.M. Ashby 445, 13.viii.1963 (AD); Nyabing, V.F. McDougall, 23.ix.1935 (PERTH); 4 miles N of Nyabing, K. Newbey 428, 2.ix.1962 (PERTH); 14 miles NE of Gnowangerup, K. Newbey 3437, 16.ix.1971 (PERTH); E of Kondinin, 32°27'S 118°30'E, A.S. George 9880, 30.vi.1970 (PERTH).

*Distribution and ecology*: *Boronia ternata* var. *austrofoliosa* occurs in an area bound approximately by Lake Grace, Tarin Rock, Nyabing, Gnowangerup and Ongerup, Western Australia (Fig. 3). It is found in heath and mallee woodland on sand and laterite.

*Conservation status*: A ROTAP code of 2RC- is appropriate; found in Tarin Rock Reserve.

*Etymology*: The varietal epithet is derived from the Latin, *austro* (southern) and *foliosus*

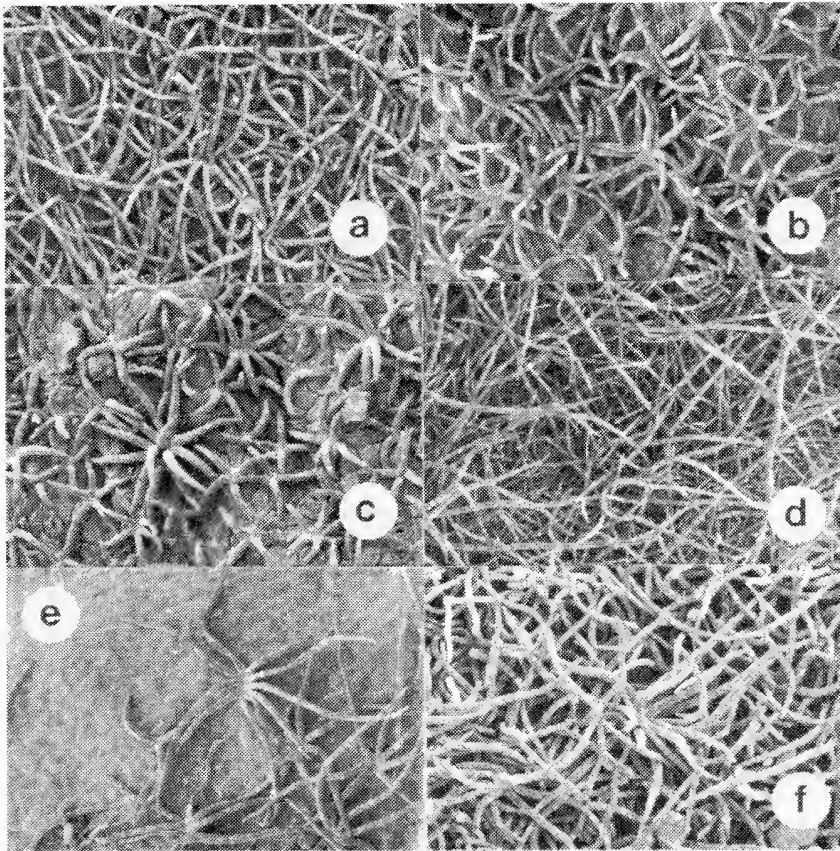


(leafy), and alludes to this variety being the southern form of *B. ternata* var. *foliosa*, within which specimens previously had been placed.

**7. *Boronia adamsiana*** F. Muell., *Proc. Linn. Soc. New South Wales* 5: 15 (1890). *Type citation*: "In the eastern interior of West Australia, at Mangowine, with *Cyanostegia Turczaninowii*; Miss A. Adams." *Type*: Mangowine (Eastern Interior W.A.), Miss Annie Adams, 1889 (lectotype, here designated, MEL 2041246; isoelectotypes K *n.v.* (cibachrome MEL 2041217; photograph AD 99548106), NSW 122240, PERTH 999172).

*Illustration*: S. Hopper *et al.*, *Western Australia's Endangered Flora*, 39 (1990).

Erect, much branched *shrub* to 1 m tall, with a woolly, grey, dense stellate indumentum on the branches, leaves and inflorescence parts (Fig. 4d). Multiangular stellate hairs with c. 10–20 rays; rays 0.5–2 mm long. Branch hair density even, becoming glabrous as they age. *Leaves* trifoliolate, sessile; leaflets elliptic to oblanceolate, attenuate; terminal leaflet 5–17 mm long, 1.5–5 mm wide; lateral leaflets 4–15 mm long, 1–5 mm wide.



**Fig. 4.** Scanning electron micrographs of leaf-surfaces of *B.* subsect. *Ternatae*. **a** - *B. ternata* var. *ternata* (Duretto *et al.* 182, MEL, x100); **b** - *B. ternata* var. *promiscua* (Duretto *et al.* 221A, MEL, x140); **c** - *B. ternata* var. *austrofoliosa* (Duretto *et al.* 233, MEL, x140); **d** - *B. adamsiana* (Smith 597, MEL, x60); **e** - *B. ericifolia*, adaxial surface (Duretto *et al.* 154, MEL, x100); **f** - *B. ericifolia*, abaxial surface (Duretto *et al.* 154, MEL, x140).

*Inflorescence* 1-flowered; peduncle 0.5–1 mm long; prophylls c. 0.5 mm long; metaxyphylls minute; anthopodium 0.5–1 mm long. Sepals ovate-deltate, acute, 3–4.5 mm long, 1.5–2 mm wide, enlarging to 6 mm long as fruit matures, about same length and width as petals; abaxial surface with a moderately dense to dense stellate indumentum. Petals 4–5 mm long, 2–2.5 mm wide, enlarging slightly as fruit matures; adaxial surface glabrous or with few hairs at tip; abaxial surface with a moderately dense stellate indumentum. Antesepalous filaments 2–2.5 mm long, the distal c. 0.5 mm prominently glandular; antepetalous filaments c. 1.5 mm long; abaxial surface of anther not frosty; anther-apiculum large, reflexed. *Cocci* c. 4 mm long, e. 2 mm wide, with a sparse to moderately dense simple and/or stellate indumentum. Seed 2.5–3.5 mm long, 1–1.5 mm wide. *Barbalin Boronia*.

*Selected specimens examined (of c. 20 collections):* WESTERN AUSTRALIA; SOUTH WEST BOTANICAL PROVINCE; AVON REGION: North Wialki, 13 miles from Beacon to Wialki Rd, 30°17'S 118°04'E, *B.H. Smith* 597, 20.vii.1985 (CANB, MEL, PERTH); Kuser Rd/Burakin-Bonnie Rock Rd between 3.8 and 4.8 km N of junction with Bonnie Rock-Mukinbudin Rd, 30°31'S 118°17.5'E, *P.H. Brown* 98 and *J. Carter*, 14.ix.1990 (PERTH); Allotment CG4052, 30°25'S 118°03'E, *M.F. Duretto* 172 and *M. Bayly*, 18.viii.1992 (MEL, NSW, WAU); E of Barbalin North Rd with access c. 12 km NNE of Kalyanbudding Hill, 22.5 km NNW of Mukinbudin, 30°43'S 118°09'E, *F.H.* and *M.P. Mollemans* 3359 (PERTH); 3 and 3.25 km S of junction of Barbalin North Rd and Aitken Rd, 8.15 km NNW of Mukinbudin, 30°43'50"S 118°08'30"E, *F.H.* and *M.P. Mollemans* 3358, 5.ix.1990 (PERTH); 1.5 km NW of Dajoing Rocks and 9.5 km NW of Wialki, Northern Wheatbelt, 30°25'S 118°02'E, *F.H.* and *M.P. Mollemans* 3374 (PERTH); Barbalin Rock Water Reserve, c. 13 km SW of Mukinbudin, 30°58'S 118°6'E, *H.C. Venning s.n.*, 19.vi.1987 (PERTH); 22.75 km 154 deg. from Trayning and 3.68 km along Doherty Rd from Ryans Rd, 31°18'19"S 117°53'38"E, *F.H.* and *M.P. Mollemans* 3215, 20.viii.1990 (PERTH); 8 miles N of Wialki, 30°22'S 118°7'E, *J.S. Beard* 4725, 16.vii.1967 (PERTH); Clark Rd, 22.1 km N of Bonnie Rock-Barakin Rd, c. 13 km N of Conical Hill, 30°16'S 118°4'E, *A.S. George* 16433, 21.x.1984 (CANB, PERTH); 175 mile peg on Wubin-Paynes Find Rd, *A. Fairall* 1765, 19.vii.1966 (CANB, PERTH).

*Typification:* A single collection is cited in the protologue of *B. adamsiana*: 'In Eastern interior of W.A., at Mangowine, *Miss A. Adams*.' Specimens matching this information have been located at MEL, NSW and PERTH. The MEL specimen is the largest, and in the best condition, and is chosen as the lectotype.

*Notes:* *Boronia adamsiana* differs from *B. ternata* by the longer rays on the stellate hairs (0.5–2, not 0.045–0.5 mm long; Figs 4a–d) that give the plant a woolly appearance, and sepals that are approximately as long as, rather than much shorter than, the petals. Rao and Bhattacharya (1981) reported that this species has polymorphic, branched sclereids.

*Distribution and ecology:* *Boronia adamsiana* occurs in the Mukinbudin-Wialki area, and an isolated collection has been made on the Wubin-Paynes Find Road, Western Australia (Fig. 3). It is found in scrub and heath on yellow sand often near granite outcrops (Hopper *et al.* 1990). Flowering and fruiting: June–October.

*Conservation status:* Once thought to be extinct (Hopper *et al.* 1990), but now *B. adamsiana* is known from several populations. Some of these populations are in small reserves, for example Karroun Hill NR. Briggs and Leigh (1996) gave a ROTAP code of 3V to this species but 3VC- is probably appropriate.

*Boronia* sect. *Valvatae* subsect. *Ternatae* ser. 2. *Ericifoliae* Duretto ser. nov. Foliola elliptica anguste, revoluta, acuta, et discoloria. *Sp. typica:* *B. ericifolia* Benth.

*Leaves* trifoliolate; the leaflets narrowly elliptic to linear, acute, strongly discolourous,



paler beneath, dorsiventral, adaxial surface glabrous or with a sparse indumentum, abaxial surface with a moderately dense to dense indumentum (Figs 4e, f), the margins revolute. *Style* glabrous.

The series contains two species in south-western Australia (Fig. 3) and is characterised by narrowly elliptic, discolourous leaves with revolute margins. Both species are found on lateritic hills.

8. *Boronia ericifolia* Benth., *Fl. austral.* 1: 313 (1863). *Type citation*: "W. Australia, Drummond, Coll. 1843, n. 46." *Type*: Swan River, W. Australia, *Drummond n. 46*, Coll. 1843 (lectotype, here designated, K (*hb. benth.*) *n.v.* (cibachrome MEL 2041215, photograph AD 99548138); isolectotypes BM *n.v.* (transparencies MEL 2041219, PERTH), K (ex Linnean Society) *n.v.* (cibachrome MEL 2041216), MEL 2041253).

Erect, much branched *shrub* to 1.5 m tall. Multiangular stellate hairs with 2–10 rays; rays 0.05–0.25 mm long (Figs 4e, f). Branches with a moderately dense to dense stellate indumentum, the hair density even, becoming glabrous as they age. *Leaves* sessile, trifoliate, sometimes simple on few nodes of auxiliary branches; terminal leaflet longer than laterals, 4–11 mm long, 0.5–1.5 mm wide; lateral leaflets 3–10 mm long, 0.5–1 mm wide. *Inflorescence* with a moderately dense to dense stellate indumentum; peduncle 0.5–1 mm long; prophylls 0.5–1 mm long, 0.5–1 mm wide; metaxyphylls minute; anthopodium 1–2 mm long. Sepals narrowly deltate, 2.5–3 mm long, 1–1.5 mm wide, acute, not enlarging significantly as fruit matures; adaxial surface glabrous; abaxial surface with a dense stellate indumentum (Fig. 4f). Petals 5–7 mm long, 2.5–3.5 mm wide, enlarging slightly as fruit matures; adaxial surface with a sparse simple or stellate indumentum, becoming glabrous towards base; abaxial surface with a dense stellate indumentum. Antesepalous filaments c. 1.5 mm long, the distal c. 0.5 mm prominently glandular; antepetalous filaments c. 1 mm long; abaxial surface of anther not or slightly frosty, anther-apiculum large and reflexed. *Cocci* 3.5–5 mm long, 2–3 mm wide, glabrous. Seeds 2.5–3.5 mm long, 1.5–2 mm wide. *Wongan Hills Boronia*.

*Selected specimens examined* (of c. 25 collections): WESTERN AUSTRALIA; SOUTH WEST BOTANICAL PROVINCE; AVON REGION: Rows Rd W of Moora, 30°42'S 115°52'E, F.W. Humphreys 28, 6.ix.1966 (PERTH); 8 miles W of Moora, 30°37'S 115°52'E, K.R. Newbey 2305, 1.ix.1965 (PERTH); Near Great Eastern Highway, S of Pithara, B. and B. Backhouse BE1, 11.vi.1992 (PERTH); Marne Rd, S of Pithara, B. and B. Backhouse BE2, 19.iv.1992 (PERTH); 5 km N of Marne-Northam-Pithara Rd, B. and B. Backhouse N/627, 11.vi.1992 (PERTH); Kondut in Wongan Hills, 30°42'S 116°46'E, C.A. Gardner 2721, 23.ix.1931 (PERTH); Mt Matilda, c. 7 miles NW of Wongan Hills, 30°48'S 116°37'E, B.H. Smith 1349, 21.viii.1990 (CANB, MEL); Monk's Well Gully, 1.5 km NE of Mt Rupert, Wongan Hills, 194 km NE of Perth, K.F. Kenneally 1322, 15.vi.1974 (PERTH); 15.9 km along Wongan-Piawanning Rd, from the Wongan Hills Township, 30°49'S 116°35'E, L. Nunn 34, 4.ix.1985 (CANB; PERTH); Wongan Hills, 1 km E of Wilding Rd turnoff on Wongan Hills-Piawanning Rd, c. 30°50'S 116°35'E, M.F. Duretto 152 and M. Bayly, 13.viii.1992 (MEL); Wongan Hills, exactly 10 km along Wilding Rd from junction with Wongan Hills-Piawanning Rd, c. 30°50'S 116°35'E, M.F. Duretto 154 and M. Bayly, 13.viii.1992 (MEL, NSW, WAU); 10 km from Wongan Hills towards Piawanning, 30°50'S 116°39'E, J. Taylor 2191 and P. Ollerenshaw, 24.ix.1983 (CANB, MEL); Wongan Hills, Pistol club, 30°53'S 116°42'E, B.H. Smith 669, 18.vii.1986 (CANB, MEL, NSW); Fowlers Gully, 2 km S of Wongan-Piawanning Rd, Wongan Hills, 194 km NE of Perth, K.F. Kenneally 2334, 21.viii.1974 (MEL, PERTH).

*Typification*: Bentham (1863) cited only one specimen when describing *B. ericifolia*: 'W.Australia, Drummond, Coll 1843, n. 46'. Specimens matching this collection have been located at MEL, K (two specimens, from the Swan River) and BM. Annotations on

one of the K sheets state that it was a gift from the Linnean Society in 1915 and the other is stamped 'herbarium benthamianum 1854'. No specimens from LINN have been seen. The specimen from Bentham's herbarium (K) is in excellent condition and is here chosen as the lectotype.

*Notes:* *Boronia ericifolia* can be distinguished from *B. revoluta* by its sessile leaves.

*Distribution and ecology:* The species occurs in the Wongan Hills and the Moora areas, Western Australia (Fig. 3), where it is found growing in heath and woodland on laterites. Flowering: June–October; fruiting: August–October.

*Conservation status:* *Boronia ericifolia* was given a ROTAP code of 2KC- by Briggs and Leigh (1996) and a Priority Two rating, following the Western Australian Department of Conservation and Land Management for Western Australian taxa, by Hopper *et al.* (1990): found in the Wongamine NR. During field work in 1992 only a few, isolated plants were seen: further surveys are required to ascertain the size and status of the populations.

**9. *Boronia revoluta*** Paul G. Wilson, *Nuytsia* 1: 201 (1971). *Type:* South Ironcap (c. 45 km NNE of Lake King township), 32°42'S 119°40'E, K.R. Newbey 3288 ['2388' *sphalm*], 4.ix.1970 (holotype PERTH 999180 (photograph PERTH 1636286); isotypes K n.v., PERTH 1636286).

*Illustration:* S. Hopper *et al.*, *Western Australia's Endangered Flora*, 39 (1990).

Erect, much branched *shrub* to 1 m tall. Multiangular stellate hairs with 2–6 rays; rays 0.1–0.25(–0.5) mm long. Branches with a sparse to dense stellate indumentum, the hair density even, becoming glabrous as they age. *Leaves* trifoliate, sometimes simple at first few nodes of axillary branches; petiole 1–2 mm long, winged; leaflets sessile; terminal leaflet 4–8 mm long, 0.5–1 mm wide, longer than laterals; lateral leaflets 2.5–7 mm long, 0.5–1 mm wide. *Inflorescence* glabrous or with a sparse indumentum; peduncle 2–3 mm long; prophylls and metaxyphylls 1–1.5 mm long, c. 0.5 mm wide; anthopodium 0.5–1 mm long. Sepals narrowly deltate, acute, 3–3.5 mm long, 1–1.5 mm wide, not enlarging significantly as fruit matures; adaxial surface glabrous or with few simple hairs; abaxial surface with a sparse to moderately dense stellate indumentum. Petals 6–7 mm long, 3–4 mm wide; adaxial surface sparsely simple pubescent, becoming glabrous towards base; abaxial surface with a moderately dense stellate indumentum. Antesepalous filaments c. 1.5 mm long, the distal c. 0.5 mm prominently glandular; antepetalous filaments c. 1 mm long; abaxial surface of anther not frosty, anther-apiculum large and reflexed. *Cocci* glabrous (mature cocci not seen). Seed (not seen) c. 2.5 mm long, reniform, dull (*fide* Wilson 1971). *Ironcaps Boronia*.

*Additional specimens examined:* WESTERN AUSTRALIA; SOUTH WEST BOTANICAL PROVINCE; ROE REGION: South Ironcap, 45 km NNE of Lake King township, 32°40'S 119°46'E, E.K. Newbey 5228, 8.vii.1979 (CANB, PERTH); Near summit of South Ironcap, 2.3 km N along Forrestiana (Hatters Hill)–Southern Cross Rd from junction with Carstairs Rd (from Varley), 32°40'S 119°46'E, M.F. Duretto 209–213 and M. Bayly, 22.viii.1992 (MFD209: AD, BRI, HO, MEL; MFD210 & 211–MEL; MFD212: CANB, MEL; MFD213: CANB, MEL, NSW, WAU); 20 m E of survey marker designating Hatters Hill, G. Barrett, 20.viii.1989 (PERTH); Hatter's Hill, 30 miles NE of Lake King, 32°49'S, 119°59'E, H. Steedman 32, x.1929 (PERTH); c. 50–150 m N and NNE of Hatter Hill Trig and survey mark, 90 km N of Ravensthorpe, 32°49'S 119°58'E, F.H. and M.P. Mollemans 3187, 15.vii.1990 (PERTH).

*Notes:* *Boronia revoluta* is distinguishable from *B. ericifolia* by its petiolate leaves.

*Distribution and ecology:* *Boronia revoluta* is known from two ironstone hills: South Ironcap and Hatters Hill, north-east of Lake King, Western Australia (Fig. 3), and grows

in heath and woodland on ironstone. Extensive searches of Middle Ironcap (north of South Ironcap) in 1992 did not locate any plants. Flowering: July–October; fruiting: September–December.

*Conservation status*: 2V (Briggs and Leigh 1996). This species is known from two small populations outside existing conservation reserves in an area where mining interests are becoming apparent, especially at Hatters Hill.

***Boronia* sect. *Valvatae* subsect. 2. *Bowmaniae* Durretto, subsect. nov.** Radii pilorum stellatorum connati. Foliola et petala in pagina abaxiale plana. *Sp. typica*: *B. bowmanii* F. Muell.

Stellate hairs scssile; all rays appressed, fused, smooth, glossy, firm, white. Branches quadrangular, with or without obvious glands, the hairs denser between decurrent leaf bases. *Leaves* imparipinnate; rachis segments winged, wider at the distal end; leaflets dorsiventral, epicuticular wax platelets absent, the midrib not or slightly raised on the abaxial surface, not or slightly impressed on the adaxial surface, tightly packed tissue between midvein and abaxial epidermis with secondary thickening, margins plane or slightly recurved. *Inflorescence* (1–)3–7-flowered; peduncle woody, persistent after flowers; prophylls minutely unifoliolate or imparipinnate. Sepals shorter and narrower than petals, adaxial surface glabrous or glabrescent. Petals green to white, midrib not raised on the abaxial surface. Filaments clavate, tapering at apex, pilose below glandular tip, antepetalous filaments smooth; anthers attached to the apex of the filament, all equal. Disc entirely within stamen whorl. *Seeds* elliptical with adaxial side flattened and without ridge, shiny, black; tubercles smooth, fused or unfused.

A subsection of two species from north Queensland (Fig. 5) that is characterised by glabrescent leaves, stellate hairs with partially fused rays (especially noticeable on the abaxial surface of the petals), petals and leaves without a raised midrib, and shiny black seeds.

10. ***Boronia bowmanii*** F. Muell., *Fragm.* 4: 135 (1864) (as *B. Bowmani*). *Type citation*: “Ad flumen Cape River. *E. Bowman*”. *Type*: Cape River, E. Bowman (lectotype, here designated, MEL 249188); Cape River, ? *E. Bowman* (probable isoelectotypes BRI AQ318442, MEL 249187).

*Boronia platyrrachis* F. Muell., *Fragm.* 7: 37 (1869). *Type citation*: “In montibus arenoso-atque schistoso-rupestribus ad junctionem amnis Percy-River cum flumin Gilberti; *R. Daintree*.” *Type*: Main Gilbert River near the junction of the Percy River on sandstone rocks [c. 19°09'S 143°27.5'E, Cook, Qld], *R. Daintree* s.n. (holotype MEL 249186).

Erect, much branched *shrub* to 1 m tall, with a sparse stellate indumentum or glabrescent on the branches, leaves and inflorescence parts. Multiangular stellate hairs with c. 8–20 rays; rays to 0.3 mm long. Branches glandular, becoming glabrous as they age. *Leaves* 40–95 mm long, 20–70 mm wide in outline, with 3–9 leaflets; petiole 5–23 mm long, winged; rachis segments 5.5–15 mm long, 1–3 mm wide, winged, broader at the distal end; leaflets sessile, narrowly elliptic, discolourous, paler beneath, acute; terminal leaflet 10–60 mm long, 1.5–4 mm wide, longer than preceding laterals but otherwise shortest; lateral leaflets 5–33 mm long, 1–4 mm wide. *Peduncle* 1–5(–11) mm long; prophylls 1–7 mm long, 0.5–1 mm wide; metaxyphylls minute to 0.5 mm long; anthopodium 3–10 mm long. Sepals ovate-deltate, acute, 1.5–2.5 mm long, 1–2 mm wide, not enlarging significantly as fruit matures; abaxial surface glabrous. Petals 3–4 mm long, 2–3 mm



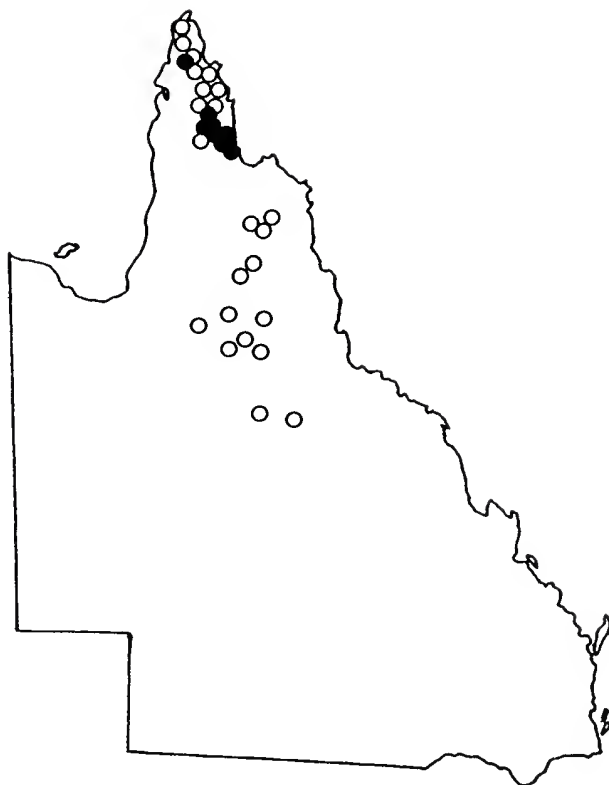
wide, enlarging to 4–6 mm long as fruit matures; adaxial surface with a sparse simple indumentum, becoming glabrous towards base; abaxial surface with a sparse stellate indumentum, the hairs concentrated on the midrib. Antesepalous filaments c. 1.5 mm long, the distal 0.5–0.75 mm prominently glandular; antepetalous filaments c. 1 mm long; abaxial surface of anther not frosty; anther-apiculum reflexed. Style glabrous. *Cocci* 4.5–5 mm long, 2–3 mm wide, glabrous. Seeds 3–4 mm long, 1.5–2 mm wide; tubercles fused into a irregular pattern.

*Selected specimens seen (of c. 45 collections):* QUEENSLAND; COOK DISTRICT: 14.7 km S of Mutee Heads turnoff on the new road from Bamaga to Jardine R. crossing, c. 10 km N of crossing, 11°3'S 142°22'E, *J.R. Clarkson* 6136A, 29.viii.1985 (BRI, CANB, DNA, MBA, PERTH, QRS); Tributary of Bridge Ck crossing Cape York Devel. Rd, 11°15'S 142°23'E, *C.F. Puttock* and *R.J. King*, 17.vii.1984 (BRI); 1 km NE of Glennic Ck crossing on the Track from Bromely to Bott head, 12°17'S 142°58'E, *J.R. Clarkson* 8799 and *V. J. Neldner*, 13.vii.1990 (CANB, MBA); Rollsite, 8.3 km E past Maloney's Springs, 48.3 km E by road from Moreton Telegraph Station, 12°28'S 143°00'E, *P.I. Forster* 5328, 20.vi.1989 (BRI, CANB); Kennedy Rd, 2 miles N of Pascoe R., 12°45'S 143°5'E, *C.H. Gittens* 1014, viii.1965 (BRI, NSW); Wenlock R., 17.6 km E of the Peninsula Development Rd, 12°50'S 142°52'E, *V.J. Neldner* 2818 and *J. R. Clarkson*, 28.x.1989 (BRI, MBA); Cabbage Tree Ck, c. 17 km ENE of the Ranger Station, Rokeby NP, 13°38'S 142°49'E, *D.G. Fell* 2289, 24.iv.1991 (BRI, QRS); Flinders Island, 14°11'S 144°15'E, *J.L.E. Cussan* 527, 30.v.1995 (BRI); 12 km N of Fairlight in Fairview-Palmerville Rd, 15°40'S 144°03'E, *J.R. Clarkson* 3251, 22.iv.1980 (BRI, DNA, MBA, NSW, QRS); 4.3 km along the Maytown Track travelling S from the Jowalbinna turn off, SW of Laura, 15°46.63'S 144°16.44'E, *M.F. Duretto* 400 and *A. Vadala*, 24.v.1993 (BRI, MEL); 20 miles NW of the Walsh R. Crossing, 16°45'S 144°5'E, *B. Hyland* 5852, 27.i.1972 (QRS); 42 km along road to Blackdown Station, off the Chilligo to Wrotham Park Rd, 17°1'S 143°47'E, *P.I. Forster* 8406, 1.vi.1991 (BRI, MEL, PERTH); NORTH KENNEDY DISTRICT: Swamp Ck, Tin Dump, 'Mt Surprise', 18°0+S 149°0+E, *I.G. Champion* 372, 30.iii.1988 (BRI); 40 km N of Georgetown, 18°00'S 143°28'E, *B.L. Rice* 2413, 27.v.1977 (BRI, CANB, NSW); Cave Ck, *Arnit* 760 (*Robertson*) (MEL); c. 9 km W of the Stockmans Ck crossing towards Forsyth from Einasleigh, 18°32.71'S 143°52.41'E, *M.F. Duretto* 375 and *A. Vadala*, 17.v.1993 (BRI, CANB, MEL, NSW); S of Forsyth, Cobbold Ck Gorge, 18°50'S 143°24'E, *C. Dalliston* HC389, 11.viii.1987 (BRI); Mt Sturgeon Station, N of Hughenden [20°27'S 144°16'E], *C.E. Hubbard* 7747 and *C. Winders*, 16.xi.1931 (BRI); 8.5 miles W of Pentland Township, 20°32'S 145°16'E, *M. Lazarides* 3550, 20.vi.1953 (CANB, DNA); North Brand Ck, White Mountains NP, W of Charters Towers, 20°36'S 145°10'E, *A.R. Bean*, 13.iv.1992 (CANB); Crest of western escarpment of Great Dividing Ra., 12 miles E of 'The Lynd' [18°56'S 144°23'E], *S.T. Blake* 19463, 11.vii.1954 (BRI, CANB).

*Typification:* One collection is cited in the protologue of *B. bowmanii*: 'Ad flumen Cape River, *E. Bowman*'. A single specimen matching the locality and collector information has been located at MEL and is designated the lectotype. Other specimens matching the locality information, but without the collector information, have been located at MEL and BRI, and are probably duplicates.

*Notes:* Mueller described *B. bowmanii* and *B. platyrrachis* five years apart and must have realised his duplication since he did not list *B. platyrrachis* in either of his census of the Australian flora (Mueller 1882, 1889).

Specimens of *B. bowmanii* collected in areas north of Laura tend to have much narrower leaflets and marginally less hirsute petals than those found south of Laura. Specimens collected around the Jardine River have extremely narrow leaflets while collections from the Iron Range have leaves that are intermediate between the narrow- and wider-leaflet forms. If further collections and research show these forms warrant taxonomic recognition then the northern taxa will require new names as both *B. bowmanii* and *B. platyrrachis* were described from southern material.



**Fig. 5.** Distribution of *Boronia* subsect. *Bowmaniae*: *B. bowmanii* (O), *B. squamipetala* (●).

*Boronia bowmanii* is distinguished from *B. squamipetala* by its longer and narrower leaflets, shorter petals with a sparse indumentum on the abaxial surface; and from other north Queensland boronias by having plane and very narrow, glabrous to glabrescent leaflets.

**Distribution and ecology:** *Boronia bowmanii* occurs between Bamaga and Charters Towers/Pentland, mainly along the Great Dividing Range, Queensland (Fig. 5); it is absent from the Humid Wet Tropics. The species is found in open forest, woodland and heath communities, mainly on sand or sandstone. Flowering and fruiting: January–October.

**Conservation status:** Though common, widespread and represented in several reserves in the northern end of its range, the southern populations are few, isolated and not represented in reserves.

11. *Boronia squamipetala* Durretto, *Austrobaileya* 5: 295 (1999). *Type*: 19 km from Peninsula development Rd on a track to Wolverson via the Cook Tin Mine, 13°21'S 143°3'E, J.R. Clarkson 10112 and V.J. Neldner, 23.vi.1993 (holotype MEL 2036781; isotypes BRI AQ621834, K n.v., L, MBA, MEL 2036782).

*Boronia* sp. "Massy Creek, Rocky River" (R. Coveny 7174) *sensu* Thomas and McDonald (1987, p. 49; 1989, p. 46).

*Boronia* sp.3 (Massey Creek, Rocky River; *R. Coveny* 7174) *sensu* Briggs and Leigh (1996, p. 167).

*Boronia* sp. (Massey Creek *R.G. Coveny*+ 7174) *sensu* Forster (1997, p. 185).

Erect, much branched *shrub* to 1 m tall. Multiangular stellate hairs with c. 6–25 rays; rays to 0.1 mm long. Branches not obviously glandular, decurrent leaf bases absent, with a sparse to moderately dense stellate indumentum, becoming glabrous as they age. Leaves 33–55 mm long, 12–20 mm wide in outline, with 5–13 leaflets, glabrescent or with a sparse indumentum, the hairs mainly on the midrib; petiole 6–15 mm long, winged; rachis segments 2–10 mm long, 1–3 mm wide, winged, broader at the distal end; leaflets sessile, elliptic, acute, slightly discolourous, paler beneath; terminal leaflet 8–20 mm long, 2–6 mm wide, longer than laterals; lateral leaflets 3–13 mm long, 1–3 mm wide. Inflorescence with a sparse to moderately dense stellate indumentum; peduncle 1–2 mm long; prophylls 1–3 mm long, 0.5–1 mm wide; metaxyphylls minute to 0.5 mm long; antherpodium 2–6 mm long. Sepals ovate-deltate, acute, c. 2 mm long, c. 1 mm wide, not enlarging significantly as fruit matures; abaxial surface glabrescent or with a sparse to moderately dense stellate indumentum, the hairs mainly at base. Petals 4–7 mm long, 2.5–4 mm wide, enlarging to 6–8 mm long as fruit matures; adaxial surface glabrous or with a sparse simple indumentum, mainly at tip and along the margins; abaxial surface with a moderately dense stellate indumentum, the hairs concentrated on the midrib. Antesepalous filaments c. 1.5 mm long, the distal 0.5–0.75 mm prominently glandular; antepetalous filaments c. 1 mm long; abaxial surface of anther not frosty; anther-apiculum absent or minute to large, erect. Style glabrous. *Cocci* 4–5.5 mm long, 2.5–3 mm wide, glabrous. Seeds 3–4 mm long, 1.5–2 mm wide; tubercles unfused.

*Additional specimens examined:* QUEENSLAND; COOK DISTRICT: Heathlands Pastoral Station on road between the slaughter yard and the Telegraph Line Rd, 11°47'S 142°30'E, A. Morton 631, 15.v.1980 (BRI); Bacon Ck, Archer R., 13°20'S 142°50'E, B. Hyland 6239, 6.vii.1972 (BRI, CANB, NSW, QRS); 13 km along road to Leo Ck mine, McIlwraith Range, 13°43'S 143°12'E, Forster 10098, 3.vi.1992 (BRI, MEL); 3.5 km NNE Massy Ck crossing, Silver Plains Station, eastern fall of McIlwraith Range, 13°53'S 143°31'E, P.I. Forster 13618, 15.vii.1993 (CANB, MEL, NSW); 8 miles from Kennedy Rd on Leo Ck Track, 13°3'-S 143°2'-E, C.H. Gittens 1781, vii.1968 (BRI, CANB, NSW); T.R. 14, Leo Ck Rd, 13°40'S 143°20'E, A. Irvine 372, 22.ix.1972 (QRS); 4.2 km (2.6 miles) by road E of Wenlock R. towards Pascoe R. on Iron Range Rd, 124 km by road NNW of Coen PO, 13°06'142°59'E, R.G. Coveny 7174 and P. Hind, 16.ix.1975 (BRI, MELU, NSW, PERTII); 10 miles N of Archer R. on Kennedy Rd, 13°25'S 142°50'E, B. Hyland 7014, 26.x.1973 (BRI, QRS); Between Massy Ck and Rocky R. on Cape York Rd, 13°55'S 143°30'E, B. Hyland 5515, 16.ix.1971 (BRI, MEL, QRS); 45 km N of Coen on Cape York Rd, J. Wrigley and I. Telford NQ1710, 25.vi.1972 (BRI, CANB).

*Notes:* *Boronia squamipetala* can be distinguished from *B. bowmanii* by its shorter and wider leaflets, and by the larger petals that have a dense indumentum on the abaxial surface.

*Distribution and ecology:* *Boronia squamipetala* occurs mainly on the Iron and McIlwraith Ranges, Cape York, Queensland (Fig. 5), where it is found in open woodland or forest and heath on loams, sand, or rock pavements. Flowering and fruiting: May–October.

*Conservation status:* 3RC- (Duretto 1999): probably represented in Iron Range N.P. and McIlwraith Range N.P.

*Boronia* sect. *Valvatae* subsect. 3. *Valvatae*. *Sp. typica:* sub *infra Boronia* ser. *Valvatis indicatur*.

Multiangular stellate *hairs* sessile or stalked; rays unfused, texture various, not appressed. Branches terete to quadrangular, not obviously glandular (except *B. eriantha*), decurrent leaf bases absent (except *B. eriantha*, *B. fraseri*), the hair density usually even (except *B. eriantha*). *Leaves* simple or imparipinnate; rachis segments winged, elliptical or rarely wider at the distal end; lamina epicuticular wax platelets absent, dorsiventral, discolourous, paler beneath; the midrib raised on the abaxial surface or not, usually impressed on the adaxial surface, tightly packed tissue between midvein and abaxial surface. *Inflorescence* 1-many-flowered; secondary branches reduced so as to make the inflorescence umbel-like. Sepals shorter and narrower than petals, rarely as long (*B. quinkanensis*); adaxial surface with a dense and minute indumentum, becoming glabrous towards base, or rarely glabrous or glabrescent (*B. duiganiae*, *B. lanceolata*). Petals usually pink, sometimes white, rarely green-yellow (*B. rupicola*), abaxial surface with prominently raised midrib and usually with weak, white, fine, flexuous stellate hairs. Filaments clavate, tapering at apex, antepetalous filaments usually tuberculate; anthers attached to the apex of the filament (except *B. alulata*, *B. hoipolloi*, *B. quinkanensis*) on filament, all equal in size, abaxial surface usually frosty (except *B. rupicola*, *B. hoipolloi*). *Seeds* elliptical in outline, adaxial side flattened and without ridge, shiny, rarely dull (*B. hoipolloi*, *B. lanceolata*, *B. rupicola*), black, at magnification tuberculate; tubercles smooth, unfused.

*Boronia* subsection *Valvatae* contains 30 species (classified into four series) and is found in the Northern Territory, Queensland, New South Wales and Victoria (Figs 6-13).



Fig. 6. Distribution of *Boronia* subsect. *Valvatae*.

The subsection is characterised by the prominently raised midrib on the abaxial surface of the petals and the umbel-like inflorescence. Unlike elsewhere in this treatment, taxa in this subsection are not listed in phyletic sequence (cf. Duretto and Ladiges 1999).

*Boronia* sect. *Valvatae* subsect. *Valvatae* ser. 1. *Erianthae* Duretto, ser. nov. Foliola glabra vel indumento stellato sparso, in pagina abaxiale plana. *Sp typica*: *B. eriantha* Lindl.

Erect *shrubs*. Multiangular stellate hairs stalked or sessile. Peltate stellate hairs absent. *Leaves* petiolate, imparipinnate (rarely the younger distal leaves becoming unifoliate, *B. rubiginosa*) or simple (*B. repanda*), glabrous or with a sparse to moderately dense stellate indumentum; rachis segments triangular or oval; lamina slightly discolourous, paler beneath, the midrib not or barely raised on the abaxial surface, cells without secondary thickening between midvein and epidermis, not or barely impressed on the

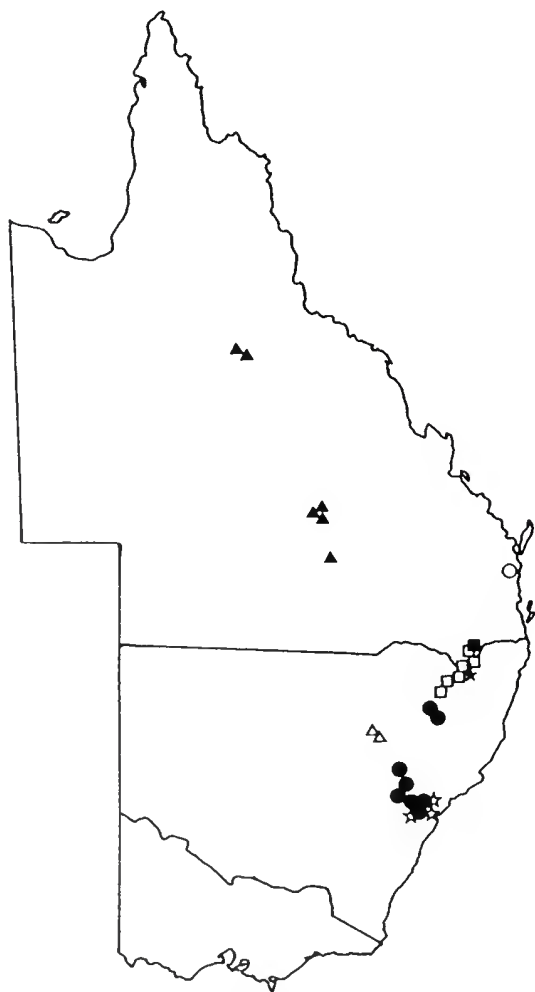


Fig. 7. Distribution of *Boronia* series *Erianthae*: *B. rubiginosa* (●), *B. eriantha* (▲), *B. warrumbunglensis* (△), *B. aff. granitica* (Bolivia Hill) (★), *B. granitica* (□), *B. repanda* (■); series *Fraseriae*: *B. fraseri* (☆), *B. keysii* (○).



adaxial surface, the margins plane or slightly recurved. *Petals* pink or white. Disc entirely within stamen whorl. Seed shiny.

A series of five species from Queensland and New South Wales (Fig. 7), characterised by the small, petiolate leaves that are glabrous or have a sparse stellate indumentum, and leaflets without a prominently raised midrib on the abaxial surface.

12. *Boronia rubiginosa* A. Cunn. ex. Endl. in Engl. *et al. Enum. pl.*, 16 (1837). *B. ledifolia* var. ? *rubiginosa* (A. Cunn. ex Endl.) Benth., *Fl. austral.* 1: 314 (1863). *Type Citation*: "Hunters-River. (A. Cunningham. 1827)". *Type*: (syntype W? *n.v.*); Hunter River ?, A.C. Cunningham, 1827 (probable syntype K (ex Linnean Society) *n.v.* (cibachrome MEL 2044562)); Mt Dangar [c. 32°21'S 150°29'E, Central Western Slopes, NSW], A.C. Cunningham 60, Aug. 1827 (probable syntype K (ex Allan Cunningham's Australian herbarium) *n.v.* (cibachrome MEL 2044563)).

*Boronia ruppil* Cheel, *J. Proc. Roy. Soc. New South Wales* 61: 404 (1928). *Type Citation*: "This species seems to be restricted to the Woods' Reef Serpentine, and was originally collected by the Rev. H. M. R. Rupp at Wollombin in September, 1912, and afterwards by Mr. A. J. Spencer." *Type*: Barraba, Rev. H.M.R. Rupp, xi.1912 (lectotype, here designated, NSW 122245); Woods Reef, Barraba District, Rev. H.M.R. Rupp, ix.1913 (probable residual syntype MEL 260366 [ex MELU]); Barraba, Mr A.J. Spencer, xi.1924 (probable residual syntype: MEL 260367 [ex MELU]).

*Boronia* sp. F (aff. *ruppil*) *sensu* Jacobs and Pickard (1981, p. 191).

*Illustrations*: A. Fairley and P. Moore, *Native Plants of the Sydney District*, 203 pl. 806 (1989, as *B. ruppil*); L. Robinson, *Field Guide to the Native Plants of Sydney*, 116 (1990, as *B. ruppil*); P.H. Weston and M.F. Porteners, *Fl. New South Wales* 2: 233 (1991, as *B. ruppil*).

*Shrub* to 2 m tall, resprouting from rootstalk. Multiangular stellate hairs sessile, 8–20 rays; rays firm, straight, white to red-brown, 0.1–0.25 mm long. Branches slightly quadrangular, with a dense stellate indumentum, becoming glabrous as they age. *Leaves* 8–46(–60.5) mm long, 4–35 mm wide in outline, with 1–5(–7) leaflets, the leaflet number per leaf increasing along branches, the younger distal leaves sometimes becoming unifoliate, glabrous or glabrescent; petiole 2–10(–15) mm long, winged; rachis segments 2–12 mm long, 1–2.5 mm wide, winged, widest at the distal end or oval; leaflets oblanceolate, sessile, plane, obtuse, glabrous to glabrescent, hairs concentrated on the midrib; terminal leaflet 4–23 mm long, 3–10 mm wide; lateral leaflets 3–11 mm long, 1–7 mm wide. *Inflorescence* 1–3-flowered, with a moderately dense to dense stellate indumentum; peduncle 2–8.5 mm long; prophylls minutely unifoliate or minutely imparipinnate, 0.5–1 mm long, c. 0.5 mm wide, with a sparse to moderately dense stellate indumentum; metaxyphylls absent or minute; anthopodium 3–10 mm long. Sepals ovate-deltate, acute, 2–5 mm long, 1–3 mm wide, not enlarging significantly as fruit matures; abaxial surface glabrous or with a sparse to dense stellate indumentum. *Petals* 6–11 mm long, 3–4.5 mm wide; adaxial surface with a sparse simple indumentum; abaxial surface glabrescent or with a sparse to moderately dense stellate indumentum. Antesepalous filaments 1.5–2 mm long, prominently glandular on the distal 0.5 mm; antepetalous filaments slightly tuberculate, 1–1.5 mm long; anther-apiculum minute to large, erect or reflexed. Style glabrous or with few hairs at base. *Cocci* 4–6 mm long, 3–3.5 mm wide, glabrous or densely hirsute. Seeds 3–4 mm long, 2–3 mm wide.

*Selected specimens examined (of c. 55 collections):* NEW SOUTH WALES: NORTHERN TABLELANDS: Woods Reef, 20 km E of Bundarra, 30°23'S 150°46'E, *D.B. Foreman* 1025, 18.viii.1985 (CANB, MEL) CENTRAL WEST SLOPES: S of Lee's Pinch Lookout area, 5.6 km N of Wollar-Sandy Hollow Rd, 32°18'S 150°02'E, *J.M. Powell* 2960, 26.vii.1987 (BRI, CANB, NSW); Goulbourn R. NP, 38.4 km SW of Merriwa on Merriwa-Mudgee Rd, 32° 18'S 150°03'E, *B. Hadlow* 572, 9.x.1988 (CANB); Bobadeen, Ulan, 32°17'S 149°45'E, *G. Althofer*, 9.vi.1973 (NSW); Holbrook Castle, 5 miles [8.1 km] S of Holbrook, 30 km SSW of Sandy Hollow, 32°44'S 150°18'E, *T. and J. Whaite* 3353, 4.ix.1969 (CANB, MELU, NSW); CENTRAL TABLELANDS: Genowlan Mt, 7 miles NE of Capertee, 33°05'S 150°04'E, *E.F. Constable* 5042, 23.ix.1964 (CANB, NSW, PERTH); Mt Penang, Berrima District, NSW, *J. Cosh*, 16.xi.1981 (NSW); Wollemi NP, Glen Davis, track on east side of Green Gully below cliff c. 1.8 km SSW of Glen Davis PO, 33°07'S 150°16'E, *F.E. Davis* 285 and *B. Rimes*, 2.xii.1987 (CANB); 10 miles W of Bowral, *R.A. Rodway* 1023, x.1919 (NSW); CENTRAL COAST: Kenthurst, *R. Rymer*, 1985 (NSW); Above Roberts Falls, Bulls Ridge, East Kurrajong, 33°29'55"S 150°47'35"E, *T.A. James* 1205, 14.x.1990 (NSW); Sandy Ridge above Turnbulb Arm of Colo R., c. 10 miles N of Wilberforce, *P. Mathews* (NSW); Blaxlands Ridge via Windsor, NSW, *C. Burgess*, 30.vii.1969 (AD, BRI, CANB, NSW); Culoul Range, btw Colo R. and Windsor-Singleton Rd, c. 6 miles NW of grassy hill, *B.G. Briggs*, 25.ii.1968 (NSW); Putty Rd, *M.E. Phillips*, 14.viii.1961 (CANB).

*Taxonomy:* Endlicher (1837) based his description of *B. rubiginosa* on material with glabrous leaves that was collected by Alan Cunningham from the Hunters River in 1827. Two collections made by Allan Cunningham in 1827 have been located at K: one is labelled 'Boronia rubiginosa. N. S. W. Mr. A. Cunningham' with an annotation slip, in a different hand, reading 'A. Cun. in Hüg. enum. Hunter R.? / 1827'; the other specimen was part of Allan Cunningham's Australian Herbarium and is labelled 'Mount Dangar, N. S. Wales, A. Cunningham No 60, Aug 1827'. [Mount Dangar is approximately five kilometres from the Hunter River.] These specimens are probably syntypes of *B. rubiginosa* and belong to the same species as the plant described by Cheel (1928) as *B. ruppii*. The name *B. rubiginosa* has been misapplied for most of this century (cf. Jacobs and Pickard 1981; Weston *et al.* 1984; Weston 1990; Weston and Porteners 1991; Duretto 1995; Briggs and Leigh 1996; Duretto and Ladiges 1999) to a taxon with a dense indumentum on the abaxial surface of the leaves (see *B. angustisepala*, species 23 below).

In the protologue of *B. ruppii* two specimens are cited: "This species seems to be restricted to the Woods' Reef Serpentine, and was originally collected by the Rev. H. M. R. Rupp at Wollombin in September, 1912, and afterwards by Mr. A. J. Spencer". A Rupp collection from Woods Reef, Barraba, made in November of 1912 has been located at NSW, and another made in September of 1913 at MEL. A Spencer collection from Barraba (September 1924) has also been found at MEL. Of these, Cheel would have only definitely seen the first collection by Rupp and, despite the mismatch of months, is chosen here as the lectotype.

*Notes:* *Boronia rubiginosa* is variable in leaf and flower size, and in the density of the indumentum on the abaxial surfaces of the sepals and petals (for a detailed discussion see Weston 1990). Currently this variation is being studied in detail by Jeremy Bruhl and Kathy Owen (NE) and preliminary results suggests that there are at least two taxa subsumed under this name. Cheel (1928) suggested that *B. ruppii* (= *B. rubiginosa*) has affinities with *B. fraseri*, from which it can be distinguished by not having a prominently raised midrib on the abaxial surface of the leaves, the smaller leaflets and the branchlets only slightly quadrangular. *Boronia rubiginosa* is more closely related to *B. eriantha* (Duretto and Ladiges 1999) from which it can be distinguished by its smooth branchlets, and to *B. warrumbunglensis* from which it differs by its larger leaves and flowers.

*Distribution and ecology:* *Boronia rubiginosa* occurs, though patchy in distribution, from Berrima to Barraba, New South Wales (Fig. 7), where it is found growing in dry woodland

on sandstone or serpentine. Flowering: July–November; fruiting: October–December.

*Conservation status*: 3RC-.

13. *Boronia eriantha* Lindl. in Mitchell, *J. expd. trop. Australia*, p. 298 (1848). *Type*: Sub-Tropical New Holland [near Mt Playfair, central Queensland, Warrego District, c. 25°03'S 147°10'E], *Lieut.-Col. Sir T. L. Mitchell* 301, 11 Sept. 1846 (lectotype, here designated, CGE (ex herb. j. lindley) *n.v.* (transparency MEL 2041243)); Sub-Tropical New Holland [camp XLVI, near the Pyramids, Leichhardt district, Qld, c. 24°10'S 147°24'E], *Lieut.-Col. Sir T. L. Mitchell* 296, 5 Sept. 1846 (residual syntype CGE (ex herb. j. lindley) *n.v.* (transparency MEL 2041239 - left hand specimen)); Sub-Tropical New Holland [near the Pyramids or Mt Faraday, Leichhardt District, Qld, c. 24°10'S 147°24'E], *Lieut.-Col. Sir T. L. Mitchell* 403, 10 Oct. 1846 (residual syntype CGE (ex herb. j. lindley) *n.v.* (transparencies MEL 2041239, right hand specimen)); River Salvatore [Leichhardt District, Qld, c. 24°30'S 147°30'E], *Colonel Mitchell*, 2–5 Sept. 1846 (residual syntype MEL 249190); Sub Tropical New Holland, *Lieutenant-Colonel Sir T. L. Mitchell* 354 (*LINDLEY*), 1846 (residual syntype NSW); Near Mt Pluto [Leichhardt District, Qld, c. 25°S 147°19'E], *Sir Th. Mitchell* No. 403 (residual syntype MEL 249189); In Australia orientalis sub tropica [central Qld], *Mitchell* (residual syntype BM (ex herb. h.f. hance 4638) *n.v.* (transparency MEL 2041220)); New Holland, [near Mt Playfair, central Queensland, Warrego District, c. 25°03'S 147°10'E], *Sir T.L. Mitchell* 304, 11.ix.1846 (residual syntype TCD).

Much branched *shrub* to 2 m tall. Multiangular stellate hairs sessile, c. 8–20 rays; rays firm, straight, dull, white to red-brown, 0.1–0.25 mm long. Branches quadrangular, with a moderately dense to dense stellate indumentum between the decurrent leaf bases, other areas glabrous or with a sparse indumentum, becoming glabrous as they age, with obvious hemispherical glands. *Leaves* (5–)10–24 mm long, (2–)6–16 mm wide in outline, with (1–)3–11 leaflets, the leaflet number per leaf increasing along branches, the younger distal leaves not becoming unifoliate, sometimes obviously glandular, glabrous or glabrescent; petiole 2–6 mm long, not winged; rachis segments winged, the distal end wider, 3–7 mm long, 0.5–1 mm wide; leaflets sessile, slightly oblanceolate, obtuse, glabrous to glabrescent, hairs concentrated on the midrib, plane; terminal leaflet 2–7.5 mm long, 1–3.5 mm wide, shorter than laterals, the midrib slightly reflexed; lateral leaflets 3–9 mm long, 1–3.5 mm wide. *Inflorescence* 1(–3)-flowered, glabrous to glabrescent; peduncle 0.5–2.5 mm long; prophylls minutely unifoliate or minutely imparipinnate, 0.5–3 mm long, to 1 mm wide; metaxyphylls minute to 1.5 mm long; anthopodium 3–6 mm long. Sepals ovate-deltate, acuminate, 2–5 mm long, 1.5–3 mm wide, not enlarging significantly as fruit matures; abaxial surface glabrous to glabrescent or with a dense stellate indumentum (in some specimens from n. Qld). Petals 6–11 mm long, 3.5–5 mm wide, enlarging slightly as fruit matures; adaxial surface glabrescent to sparsely simple pubescent; abaxial surface with a moderately dense to dense stellate indumentum. Antesepalous filaments 2–2.5 mm long, prominently glandular on the distal 0.5–1 mm; antepetalous filaments slightly tuberculate, 1–1.5 mm long; anther-apiculum minute or large, erect or reflexed. Style glabrous. Cocci c. 5.5 mm long, 3–3.5 mm wide, with a sparse to moderately dense simple and/or stellate indumentum. Seeds 3.5–4 mm long, 2–2.5 mm wide.

*Selected specimens examined* (of c. 30 collections): QUEENSLAND; NORTH KENNEDY DISTRICT: Narrow gorge on a tributary of Oxley Ck, White Mountains, N of Hughenden, 20°19'S 144°29'E, *M. Godwin* C2771, vii.1984 (BRI); Edge of White Mountains at 'Warang' Station, NQld, c. 20°26.5'S 144°50.0'E, 7857-741383, *M.F. Duretto* 369 and *A. Vadala*, 15.v.1993 (MEL);



Edge of White Mountains at "Warang" Station, c. 20°26.5'S 144°50'E, *M.F. Duretto 370* and *A. Vadala*, 15.v.1993 (BRI, JCT, MEL); Sandstone Wall, White Mountains, on gorge at head of Torrens Ck, 20°27'S 145°54'E, *R.J. Cummings 11237*, 17.vii.1991 (BRI); LEICHHARDT DISTRICT: Near Mt Mooloolong, Carnarvon Range SW of Springsure, *C. H. Gittens 1161*, vii.1966 (BRI, NSW); Salvatore Rosa NP, Sentinel Mountain, 24°48'S 147°8'E, *M.E. Ballingall MEB437*, 30.x.1981 (BRI); Yarra Gorge, Salvatore Rosa NP, c. 70 miles SW of Springsure, *L.H. Cockburn*, xii.1966 (BRI); Near Louisa Bore, Mt Playfair Station, 25°4'S 147°1'E, *J. Armstrong 1004* and *D. F. Blaxell*, 29.viii.1977 (NSW); Alice Bore, Mt Playfair Station, Northern Boundry, 25°4'S 147°1'E, *J. Armstrong 1001* and *D. F. Blaxell*, 29.viii.1977 (NSW); Near Mt Hotspur, just off Redford Rd, c. 40 km N of Mungallala, Chesterton Ra., 26°0'S 147°2'E, *P. Grimshaw* and *P. Taylor CHR1*, 5.vi.1990 (BRI); Mount Mobil Holding, 15-20 km W of Umbervill Homestead, 26°14'S 147°25'E, *P. Grimshaw CHR19*, 8.xi.1990 (BRI).

*Typification*: No specimens were cited when *B. eriantha* was described, but it can be assumed that the description was based on material that Lindley collected or saw in central Queensland while travelling with Mitchell. On the 5th of September, 1846 Mitchell's party came across a 'handsome new *Boronia*' at camp XLIV near the Pyramids (Mitchell 1848, pp. 297-8, 432) and Lindley later described this species as *B. eriantha* (*loc. id.*, p. 298). Specimens collected from this area and around this time by Mitchell or Lindley have been located at BM, CGE, MEL and NSW. Specimens collected on the 5th and 11th of September, and the 10th of October, 1846, are housed at CGE. The specimen collected on the 11th of September, 1846 (Sub-Tropical New Holland, *Lieut.-Col. Sir T.L. Mitchell 291*) is in the best condition and is chosen here as the lectotype. This collection was once in Lindley's herbarium (label on sheet), and so there is no doubt that Lindley saw this collection. As the other specimens at BM, MEL, NSW and CGE are not from the same gathering they can be treated as residual syntypes.

*Notes*: The collections of *B. eriantha* from the White Mountains or Warang differ from those from the Carnarvon Range by sometimes having a dense indumentum on the abaxial surface of the calyx, and slightly broader leaflets. This species can not be confused with any other *Boronia* species in the Carnarvon Ranges as it has glabrescent pinnate leaves and a stellate-pubescent on the stems and the abaxial surface of the petals. *Boronia eriantha* can be distinguished from *B. bowmanii* in north Queensland by its shorter and wider oblanceolate leaflets and the raised midrib on the abaxial surface of the petals, and from other members of *Boronia* subsect. *Valvatae* by the prominent hemispherical glands on the branchlets.

*Distribution and ecology*: *Boronia eriantha* occurs in the Carnarvon Ranges of central Queensland, and the White Mountains (Warang) of north Queensland (Fig. 7). Ross (1994) states that this species is also found in the Moreton and Wide Bay districts: no specimens have been seen from these regions. This species is found in eucalypt open woodland or forest on sandstone, often associated with heavily dissected gorge country. Flowers April-September; fruiting: May-December.

*Conservation status*: Briggs and Leigh (1996) gave a ROTAP code of 2RC- to this species. The disjunct population in the North Kennedy District makes a ROTAP code of 3RC- more appropriate. *Boronia eriantha* is found in the Carnarvon N.P. and Warang N.P. and is probably secure.

14. *Boronia warrumbunglensis* P. H. Weston, *Telopea* 4: 125 (1990). *Type*: New South Wales; North West Slopes, Oxley Highway, 10 km S of Coonabarabran, 31°23'S 149°15'E, *M.G. Corrick 5883*, 9.ix.1977 (holotype; NSW; isotype MEL 516903).

*Boronia* sp. G (aff. *granitica*) *sensu* Jacobs and Pickard (1981, p. 191).



*Illustration:* P.H. Weston and M.F. Porteners, *Fl. New South Wales* 2: 233 (1991).

Much branched *shrub* to 1 m tall, resprouting from rootstalk. Multiangular stellate hairs sessile, c. 6–15 rays; rays firm, straight, dull, white to red-brown, 0.1–0.25 mm long. Branches terete, with a dense stellate indumentum, hair distribution even, becoming glabrous as they age. *Leaves* 6–32 mm long, 2–27 mm wide in outline, with (1–)3–7 leaflets, the leaflet number per leaf increasing along branches, the younger distal leaves not becoming unifoliate, the leaf not obviously glandular, glabrous or glabrescent; petiole 3–6 mm long, winged; rachis segments 3.5–5 mm long, 1–1.5 mm wide, winged, widest at the distal end or oval; leaflets sessile, elliptical to oblanceolate, obtuse, plane, glabrous to glabrescent, hairs concentrated on the midrib; terminal leaflet 5–16 mm long, 1.5–3 mm wide, longer than the preceding lateral leaflets but usually shorter than others; lateral leaflets 4–16 mm long, 1–2 mm wide. *Inflorescence* 1-flowered, with a dense stellate indumentum; peduncle 0.5–1.5 mm long; prophylls minutely unifoliate or minutely imparipinnate, 1–2 mm long, 0.5–1 mm wide; metaxyphylls minute to 0.5 mm long; anthopodium 2–7 mm long. Sepals ovate-deltate, acute, 2.5–3.5 mm long, 1.5–2 mm wide, not enlarging significantly as fruit matures; abaxial surface with a dense stellate indumentum. Petals 5–6 mm long, 2.5–3 mm wide, enlarging to 8 mm long and 3.5–4 mm wide as fruit matures; adaxial surface glabrescent with few scattered simple hairs; abaxial surface with a moderately dense to dense stellate indumentum. Antesepalous filaments c. 2 mm long, the distal c. 1 mm prominently glandular; antepetalous filaments tuberculate, c. 1.5 mm long; anther-apiculum large, erect. Style glabrous. *Cocci* 5–6 mm long, 3–3.5 mm wide, glabrous to glabrescent or with a moderately dense simple and/or stellate indumentum. Seeds 4–4.5 mm long, 2–2.5 mm wide.

*Selected specimens examined (of 15 collections):* NEW SOUTH WALES; NORTH WEST SLOPES: Dandry Rd, NNE of Coonabarabran, 31°13'S 149°17'E, *P.I. Forster* 15941 and *P. Machin*, 8.xii.1994 (BR1, MEL, NSW); Ridge near Mt Weoh, 31°14'S 149°05'E, *G. Harden* 15, viii.1975 (NSW); 34.7 km from Coonabarabran Clock Tower towards the Warrumbungle's, c. 31°16'S 149°09'E, *M.F. Duretto* 72-76 and *A.S. Jenz*, 27.xii.1991 (MEL); Timor Rock, 31°16'S 149°09'E, *G. Harden* 16, viii.1975 (NSW); Mendoran Rd near Coonabarabran, *G.W. Althofer* 50, 7.ix.1945 (MEL); Warrumbungle Range, 19 km WSW of Coonabarabran, 2 km E of Burrumbuckle Rock, 31°20'S 149°05'E, *M.D. Crisp* 4355, 10.x.1978 (CANB, NSW); Siding Springs, Coonabarabran District, *H.J.R. Overall*, xi.1961 (NSW); 8 miles from Coonabarabran on the Gilgandra Rd, 31°21'S 149°17'E, *W. McRae*, vii.1962 (NSW).

*Notes:* *Boronia warrumbunglensis* can be distinguished from *B. glabra*, with which it is sympatric, by the petiolate and pinnate leaves, from *B. granitica* by the glabrous younger leaves and smaller hairs, and from *B. rubiginosa* by the narrower leaflets (< 3 mm wide) and shorter peduncles (< 3 mm long).

*Distribution and ecology:* *Boronia warrumbunglensis* occurs in and around the Warrumbungle Range, near Coonabarabran, New South Wales (Fig. 7), where it is found in dry sclerophyll woodland on sandstone. Flowering: August–December; fruiting: October–December.

*Conservation status:* 2RC-: found in Warrumbungle N.P.

### 15. *Boronia* aff. *granitica* (Bolivia Hill).

*Boronia* sp. J (Bolivia Hill) *sensu* Quinn *et al.* (1995, p. 72).

*Boronia* sp. J (*boliviensis* m.s.) *sensu* Hunter and Clarke (1998, p. 591).

*Boronia boliviensis* m.s. *sensu* Hunter and Clarke (1998, p. 616).

Much branched *shrub* to 1.5–(2.2) m tall. Multiangular stellate hairs sessile; rays straight, shiny, white to red-brown, to 0.25 mm long. Branches terete, with a moderately dense stellate indumentum, becoming glabrous as they age. *Leaves* 8–20 mm long, 8–16 mm wide in outline, glabrescent or with a sparse, stellate indumentum, with (1–3–)7–11 leaflets, the leaflet number per leaf increasing along branches, the younger distal leaves not becoming unifoliate; rachis segments 2–4 mm long, 0.5–1 mm wide, winged, the distal end wider or oval; petiole 1–3 mm long, not winged; leaflets elliptic to oblong, sessile, acute to obtuse, with a sparse to moderately dense stellate indumentum, the margins smooth, recurved to revolute; terminal and lateral leaflets 4–6 mm long, 0.5–1.5 mm wide. *Inflorescence* 1–3-flowered, with a moderately dense to dense stellate indumentum; peduncle 1–3 mm long; prophylls minutely unifoliate, to 2 mm long, to 1 mm wide; metaxyphylls minute; anthopodium 2–3 mm long. Sepals narrowly ovate-deltate, acute, 3.5–4 mm long, c. 1 mm wide, not enlarging significantly as fruit matures; abaxial surface with a moderately dense stellate indumentum. Petals pink, 5–7 mm long, 3–4 mm wide, not enlarging significantly as fruit matures; adaxial surface sparsely simple pubescent; abaxial surface with a sparse to moderately dense stellate indumentum. Antesepalous filaments 1.5–2 mm long, prominently glandular on the distal 0.5–1 mm; antepetalous filaments tuberculate, 1–1.5 mm long; anther-apiculum minute or large, erect. Style glabrous or with few hairs. *Cocci* 4–5 mm long, 2.5–3 mm wide, glabrous. Seeds 3.5–4 mm long, 1.5–2 mm wide. *Bolivia Hill Boronia*.

*Specimens examined*: NEW SOUTH WALES; NORTHERN TABLELANDS: Bolivia Hill, 33 km S of Tenterfield, J.B. Williams 89556, 2.x.1989 (MEL, NE n.v.); Bolivia Hill c. 35 km S of Tenterfield, S. Falconer and R. Morsley, 2.xii.1996 (MEL, NE n.v.).

*Notes*: This undescribed species can be distinguished from *B. granitica* and *B. repanda* by leaves that are glabrescent or with a sparse, stellate indumentum, sessile hairs, and hair rays that are short, glossy and firm; and from *B. eriantha*, *B. rubiginosa* and *B. warrumbunglensis* by its narrowly deltate sepals. It is presently known as *Boronia* species J (Bolivia Hill) by the New South Wales National Parks Service and will be formally described by J. Williams (NE).

*Distribution and ecology*: This species is restricted to Bolivia Hill, Northern Tablelands, New South Wales where found growing amongst granite boulders (J. Williams pers. comm.). Flowering: July–?; fruiting: ?–December.

*Conservation status*: 2E (J. Williams pers. comm. 1997; Hunter and Clarke 1998)

16. *Boronia granitica* Maiden & Betehe, *Proc. Linn. Soc. New South Wales* 30: 357 (1905). *Type citation*: “Howell, N.S.W. (J.H. Maiden and J.L. Boorman; Aug. ‘05).” *Type*: Howell [c. 29°57’S 151°03’E, Northern Tablelands], N.S.W., J.H. Maiden and J.L. Boorman, August 1905 (lectotype, here designated, NSW (photograph BRI); isoelectotype K n.v. (photograph AD 99548093), MEL 249192).

*Illustrations*: K.A.W. Williams, *Native Plants Queensland* 1: 33 (1979); P.H. Weston and M.F. Porteners, *Fl. New South Wales* 2: 233 (1991).

Erect, much branched *shrub* to 1.5 m tall. Multiangular stellate hairs with 6–10 rays, sometimes stalked; rays weak, flexuous, dull, white to red-brown, 0.1–0.5 mm long. Branches terete, with a moderately dense stellate indumentum, becoming glabrous as they age. *Leaves* 8–20 mm long, 2.5–15 mm wide in outline, sparsely to moderately with a dense stellate indumentum, with (1–3–)7–15 leaflets, the leaflet number per leaf increasing along branches, the younger distal leaves not becoming unifoliate, not usually glandular; petiole 1–3 mm long, not winged; rachis segments 1–4 mm long, 0.5–2 mm wide, winged, the distal end wider or oval; leaflets sessile, elliptic, acute to obtuse,

the margins sometimes with large glands, recurved (rarely plane); terminal leaflet 1–11 mm long, 0.5–2.5 mm wide, longer or shorter than lateral leaflets; lateral leaflets 1–6 mm long, 0.5–2 mm wide. *Inflorescence* 1–3-flowered, with a moderately dense to dense stellate indumentum; peduncle 1–3 mm long; prophylls minutely unifoliate, to 1.5 mm long, 0.5–1 mm wide; metaxyphylls minute; anthopodium 2–3 mm long. Sepals narrowly ovate-deltate, acute, 3.5–5 mm long, 1–1.5 mm wide, enlarging to 6 mm long and 2 mm wide as fruit matures; abaxial surface with a moderately dense stellate indumentum. Petals pink, 6–9 mm long, 3–4 mm wide, enlarging to 12 mm long and 8 mm wide as fruit matures; adaxial surface sparsely simple pubescent; abaxial surface with a sparse to moderately dense stellate indumentum. Antesepalous filaments 1.5–2 mm long, prominently glandular on the distal 0.5–1 mm; antepetalous filaments tuberculate, 1–1.5 mm long; anther-apiculum minute or large, erect or reflexed. Style glabrous. *Cocci* 4.5–7 mm long, 2.5–3 mm wide, glabrous. Seeds 3.5–4 mm long, 1.5–2 mm wide. *Granite Boronia*.

*Selected specimens examined* (of c. 25 collections): QUEENSLAND; DARLING DOWNS DISTRICT: Jolly's Falls, 2 miles W of the Summit, 28°34'S 151°56'E, *M.F. Duretto* 350, *M. Bayly* and *N. Marsh*, 15.ix.1993 (MEL); Amiens, 10 miles NW of Stanthorpe, at foot of 'Sow and Pigs', *L. Pedley* 1483, 30.x.1963 (BRI); 3.3 km SE of Glen Alpin, 28°4'S 151°5'E, *C. Gittens* 2788, 21.ix.1974 (BRI, MELU, NSW); Near The Summit, 28°—'S 151°—'E, *S.T. Blake* 21129, 4.xi.1959 (BRI); NEW SOUTH WALES; NORTHERN TABLELANDS: Silent Grove, Tenterfield District, *G. Althofer* 487, 21.vii.1971 (NSW); 6.9 km along Breakfast Ck track from the Gulf Rd (turnoff is 25.8 km from Emmaville NW along Gulf Rd), 29°14'30" S 151°31'E, *A.L. Quirico* 49, *R. Coveny* and *R.O. Makinson*, 13.x.1990 (NSW); 19 km (direct) NNW of Emmaville, 2.7 km along Flagstone Ck track from the Gulf Rd, 29°18'S 151°32'E, *A.L. Quirico* 30, *R. Coveny* and *R.O. Makinson*, 12.x.1990 (NSW); Bismuth via Deepwater, *A. McMutt*, viii.1913 (NSW); 1 km S of Howell, NSW, 29°57'S 151°03'E, *J.B. Williams*, 6.viii.1966 (BRI); The Gorge, Kangaroo Ck, c. 10 miles E of Inverell, *E.N. Mckie*, 31.iii.1933 (NSW).

*Notes:* *Boronia granitica* can be distinguished from *B. repanda* by compound leaves, from *B. aff. granitica* (Bolivia Hill) by wider leaflets with hairs that have long, flexuous rays; from *B. ledifolia* and *B. amabilis* by the sparse indumentum on the abaxial surface of the leaves; and from *B. eriantha*, *B. rubiginosa* and *B. warrumbunglensis* by the sparse indumentum of stalked hairs throughout and the narrowly deltate sepals.

*Distribution and ecology:* *Boronia granitica* is found in the Granite Belt from Stanthorpe, Queensland, to near Howell (SE of Inverell), New South Wales (Fig. 7). Recently *B. granitica* was collected c. 50 km further south (viz. 30° 17' S 151° 26' E) than any specimen here seen (Hunter and Bruhl 1997a). The species is found in open eucalypt forest or woodland or heath on granitic soils. Flowering and fruiting: July–December.

*Conservation status:* 3VC- (Briggs and Leigh 1996); found in Girraween N.P. (Qld).

**17. *Boronia repanda*** (F. Muell. ex Maiden & Betche) Maiden & Betche, *Proc. Linn. Soc. New South Wales* 31:732 (1907).

*Boronia ledifolia* var. *repanda* F. Muell. ex Maiden & Betche, *Proc. Linn. Soc. New South Wales* 29:735 (1905). *Type citation*: "Stanthorpe, Queensland, on the borders of New South Wales (J. L. Boorman; July, 1904)." *Type*: Stanthorpe, Queensland, on the borders of New South Wales, *J.L. Boorman*, July 1904 (lectotype NSW; isoelectotypes BRI AQ151273, MEL 249152, MEL 249153); Maryland near border of NSW, Edwin Hickey (residual syntype NSW; residual isosyntypes MEL 249148, MEL 249191).

*Boronia ledifolia* var. *repanda* F. Muell. ex Domin, *Beitrage zur Flora und Pflanzengeographie Australiens* 838 (1926) [=*Bibliotheca Botanica* Heft 89 (1926)].  
 Type: Süd Queensland: Stanthorpe, J. L. Boorman, 1904 (isosyntypes BRI AQ151273, MEL 249152, MEL 249153, NSW). *nom. illeg., non B. ledifolia* var. *repanda* F. Muell. ex Maiden & Betche.

*Boronia repanda* var. *alba* C.T. White, *Proc. Roy. Soc. Queensland* 53: 206 (1942).  
 Type: Darling Downs, Thulimbah (obtained at the Wild Flower Show, Queensland Naturalists' Club), C.T. White 9234, 9.ix.1933 (holotype BRI).

*Illustrations*: K.A.W. Williams, *Native Plants Queensland* 1: 37 (1979); P.H. Weston and M.F. Porteners, *Fl. New South Wales* 2: 223 (1991).

Erect, or weak, much branched *shrub* to 1 m tall. Multiangular stellate hairs sometimes stalked, 6–10 rays; rays weak, flexuous, white to yellow, 0.1–0.5 mm long. Branches terete to slightly quadrangular, with a dense stellate indumentum, becoming glabrous as they age. *Leaves* simple, 4–18 mm long, 1.5–3 mm wide, with a sparse to moderately dense stellate indumentum; petiole 0.5–1 mm long; lamina elliptic, glandular punctate, acute to obtuse, obtuse, the margins recurved to revolute. *Inflorescence* 1-flowered, with a moderately dense to dense stellate indumentum; peduncle 0.5–2 mm long; prophylls minutely unifoliate, 1–1.5 mm long, to 0.5 mm wide, with a sparse to moderately dense stellate indumentum; metaxyphylls minute; anthopodium 2–4 mm long. Sepals narrowly ovate-deltate, the apex acute, 3–4.5 mm long, 1–1.5 mm wide, enlarging slightly as fruit matures; abaxial surface with a moderately dense stellate indumentum. Petals 6–9 mm long, 3–4 mm wide, enlarging to 10 mm long and 5 mm wide as fruit matures; adaxial surface sparsely simple pubescent becoming glabrous towards base; abaxial surface with a moderately dense to dense stellate indumentum. Antesepalous filaments 1.5–2 mm long, prominently glandular on the distal 0.5 mm; antepetalous filaments c. 1 mm long, slightly tuberculate; anther-apiculum large, reflexed. Ovary glabrous, rarely sparsely hirsute; style hirsute for full length. *Cocci* 4–5 mm long, 2–2.5 mm wide, sparsely to moderately hirsute. Mature seed not seen. *Border Boronia*.

*Selected specimens examined* (of c. 20 collections): QUEENSLAND; DARLING DOWNS DISTRICT: Cottonvale School yard, 28°32'S 151°56'E, M.F. Duretto 345-349 and M. Bayly, 14.ix.1992 (MFD345: MEL, NSW; MFD346: MEL; MFD347-349: BRI, MEL); Ponzceras Rd, 0.5 miles W of Cottonvale, 28°31'S 151°56'E, K. Williams, 10.x.1970 (MEL, NSW); 2 km NW of Thulimbah, 28°32'S 151°57'E, R.W. Johnson 2915, 18.xi.1974 (BRI, CANB, MEL); c. 1 mile W of Jolly's Falls, 5 miles N of Stanthorpe, L. Pedley 1531, 30.x.1963 (BRI); Dalvern (30 miles S of Warwick), T.M. Whaite, 25.viii.1949 (NSW); Stanthorpe, J.L. Boorman, xi.1904 (NSW).

*Typification*: Maiden and Betche (1904) cited a collection made by Boorman in Stanthorpe in July 1904 when they describe *B. ledifolia* var. *repanda*: Specimens matching this information have been located at BRI, MEL and NSW, and the specimen at NSW is chosen as the lectotype. After describing the taxon Maiden and Betche (1904) noted that collections made by Hickey in Maryland (ex MEL) match with their description and that Mueller had annotated these sheets *B. ledifolia* var. *repanda*, a name they chose to adopt.

*Synonymy*: *Boronia repanda* var. *alba* is placed in synonymy: white-flowered individuals of many species of *Boronia* sect. *Valvatae* are known and in some species the flowers turn white as they age.

*Notes*: Maiden and Betche (1904, 1906) wrote that *B. repanda* was most closely related to *B. ledifolia*. It can be placed within the *B. ledifolia* group (Weston, 1990) and is the sister species of *B. granitica* (Duretto and Ladiges 1999). *Boronia repanda* differs from other members of *Boronia* sect. *Valvatae* of the Granite Belt by having simple leaves.



**Distribution and ecology:** *Boronia repanda* occurs over a very limited area (< 10 km across) in the vicinity of Stanthorpe, Queensland, and possibly also in New South Wales (Fig. 7). Leigh *et al.* (1993) noted that *B. repanda* is found only in Queensland while Weston and Porteners (1991) list New South Wales as well. The only collections from New South Wales seen are those made by Hickey from the Maryland area (MEL) on the Queensland/New South Wales border. Ross (1994) stated that *B. repanda* has also been collected in the Moreton region: no indigenous collections from this area have been seen, but there are cultivated collections. *Boronia repanda* grows in heath and woodland on granite. Flowering: July–November; fruiting October–November.

**Conservation status:** *Boronia repanda* is probably the most threatened member of *Boronia* sect. *Valvatae*: it was given a ROTAP code of 2E by Briggs and Leigh (1996). The species has not been collected in a national park, or any reserve. Most populations appear to be in small remnants or heavily disturbed areas. Agricultural expansion and clearing of remnant vegetation are threatening processes. Further surveys are needed (urgently) to ascertain the exact distribution and status of this species.

***Boronia* sect. *Valvatae* subsect. *Valvatae* ser. 2. *Fraseriae* Durretto, ser. nov.** Foliola grandia, glabra vel indumento stellato sparso, costa subtus elevata. *Sp. typica*: *B. fraseri* Hook.

Erect *shrubs*. Multiangular stellate hairs sessile, peltate stellate hairs absent. *Leaves* imparipinnate, glabrous or with a sparse stellate indumentum, sometimes the younger distal leaves becoming unifoliate, the margins plane to slightly recurved; the midrib raised on the abaxial surface with secondary thickening, impressed on the adaxial surface. *Petals* pink or white. Disc swollen. Seed shiny.

A series of two rare species of south-eastern Queensland and central coastal New South Wales (Fig. 7), that are characterised by the large, imparipinnate, leaves with prominently raised midribs and broad leaflets.

**18. *Boronia fraseri* Hook., *Curtis's Bot. Mag.* 70 (1843), t. 4052.** *Type citation*: "A native of ravines on the banks of the Nepean River. Mr Charles Fraser." *Type*: A native of ravines on the banks of the Nepean [c. 34°S 150°40'E, Central Coast, New South Wales], Mr Charles Fraser (lectotype, here designated, K (ex *hb. hook.*) *n.v.* (transparencies MEL 2041238; photograph AD 99803339)); Nepean River, Fraser (isolectotype MEL 251030); [no locality or collector information but matching lectotype in appearance]: (probable isolectotypes K (ex *herbarium hookerianum*, four sprigs), *n.v.* (transparency MEL 2041241), K (ex *herbarium hookerianum*, two sprigs), *n.v.* (transparency MEL 2041240)).

*Boronia anemonifolia* Paxton, *Paxton's Mag. Bot.* 9: 123–124 (1842) and Plate, non A. Cunn. (1825). *Type citation*: "Seeds of this pretty New Holland plant were imported by Messrs. Lodiges many years ago....we had our drawings made from the collection of these of these gentlemen in the month of May or June, 1841." *Type*: *n.v.*, description and plate decisive.

**Illustrations:** M. Baker *et al.*, *Native Plants of the Lower Blue Mountains*, 67 (1985); W.R. Elliot and D.L. Jones, *Encyclopedia of Australian Plants* 2nd ed., 342 (1985); A. Fairley and P. Moore, *Native Plants of the Sydney District*, 234, t. 809 (1989); L. Robinson, *Field Guide to the Native Plants of Sydney*, 115 (1991); P.H. Weston and M.F. Porteners, *Fl. New South Wales* 2: 233 (1991).

Erect, much branched *shrub* to 2 m tall. Multiangular stellate hairs with c. 10–20 rays; rays white to yellow, to 0.1 mm long. Branches sharply quadrangular, glabrous or glabrescent, decurrent leaf bases present. *Leaves* 40–125 mm long, 35–70 mm wide in outline, with 3–7 leaflets, the leaflet number per leaf increasing along branches, the younger distal leaves not becoming unifoliolate; petiole 8–30 mm long, winged; rachis segments 7–18 mm long, 1–1.5 mm wide, winged, elliptical; leaflets elliptic, sessile, acute to obtuse, glabrous to glabrescent; terminal leaflet 25–63 mm long, 8–16 mm wide, longer than laterals; lateral leaflets 14–40 mm long, 3–13 mm wide. *Inflorescence* 3–7-flowered, with a moderately dense indumentum; peduncle 3–15 mm long; prophylls minutely unifoliolate or minutely imparipinnate, 1–5 mm long; metaxyphylls minute to 1 mm long; anthopodium 6–17 mm long. Sepals ovate-deltate, acute, 2.5–3 mm long, 1–2 mm wide, not enlarging significantly as fruit matures; abaxial surface with a moderately dense to dense stellate indumentum. Petals 6–10 mm long, 4–5 mm wide, not enlarging significantly as fruit matures; adaxial surface sparsely simple pubescent, becoming glabrous towards base; abaxial surface with a moderately dense stellate indumentum. Antesepalous filaments c. 1 mm long, prominently glandular on the distal 0.5 mm; antepetalous filaments tuberculate, 0.5 mm long; anther-apiculum minute. Disc surrounding base of stamens. Style glabrous. *Cocci* 4–5 mm long, 2.5–3 mm wide. Whole seeds not seen. *Fraser's Boronia*.

*Additional specimens examined* (of c. 20 collections): NEW SOUTH WALES; CENTRAL COAST: Somersby Falls, A. Rodd, 23.vii.1966 (NSW); Kuring-gai Chase NP, near Cowan Ck, H.S. McKee 6646, 12.x.1958 (NSW); Bobbin Head, Kuring-gai Chase, Miss T. Harris, 23.x.1923 (AD); Oxford Falls via Manly, Miss J. Harris and Miss Butler, x.1922 (NSW); Mullett Ck, Wondabyne c. 5 miles W of Woy Woy, E.F. Constable, 13.x.1960 (AD, NSW); Nepean R., J.H. Maiden, ix.1906 (NSW); Jerusalem Bay, c. 5 miles NE of Berowra, R. Coveny, 11.ix.1966 (NSW); Lapstone Hill, W. Forsyth, ix.1901 (BRI); 3/4 km E of Campfire Ck and Glenbrook Ck, Blue Mountains NP, 33°37'S 150°36'E, G. D'Aubert 590, G. Fensom and T. Syme, 16.xi.1989 (NSW).

*Synonymy*: Paxton (1842) described and illustrated *B. fraseri* as *B. anemonifolia* Paxt., either unaware of Alan Cunningham's (1825) use of this name for a sympatric species, or assuming, from the locality information, that they were the same. Type material has not been seen for *B. anemonifolia* Paxt., but the description (that states that the plants have a sparse indumentum and have sharply quadrangular branches), with the excellent accompanying illustration leave no doubt about the application of this name.

*Notes*: Mueller (1875, p. 111) wrote that *B. fraseri* was intermediate between *B. mollis* and *B. ledifolia* and quite possibly a hybrid, while Maiden and Betehe (1904) thought it an extreme form of *B. mollis*: *Boronia fraseri* is distinct and easily distinguished from these species and from *B. keysii* by the sharply quadrangular stems. The chromosome number for *B. fraseri* is  $n=16$  (Smith-White 1954; Stace *et al.* 1993). Vesiculose to ramiform sclereids have been reported for this species (Rao and Bhattacharya 1978, 1981).

*Distribution and ecology*: *Boronia fraseri* occurs in and around Sydney and the Blue Mountains, New South Wales (Fig. 7), where it is found growing in wet sclerophyll forest and rainforest in gullies on sandstone (Weston and Porteners 1991). Flowering: July–October; fruiting: October–November.

*Conservation status*: 2RCa (Briggs and Leigh 1996): found in Blue Mountains N.P., Brisbane Waters N.P., Ku-Ring-Gai Chase N.P. (Briggs and Leigh 1996), and Glenbrook Native Plant Reserve (Baker *et al.* 1985).

**19. *Boronia keysii*** Domin, *Beitrag zur Flora und Pflanzengeographie Australiens* 838 (1926) [= *Bibliotheca Botanica* Heft 89, 284 (1926). *Type citation*: "Queensland: Lake Cootharaba, J. Keys 1909, in herb. meo." *Type*: (syntype PR ? *n.v.*; isosyntype BRI *n.v.* (seen by B. A. Lebler, *Queensland Agric. J.* 98: 619, 1972)).

*Illustrations:* B.A. Lebler, *Queensland Agric. J.* 98: 619 (1972); K.A.W. Williams, *Native Plants Queensland* 1: 33 (1979); J. Leigh *et al.*, *Extinct and Endangered Plants of Australia*, 321 (1984).

Erect, much branched *shrub* to 2 m tall. Multiangular stellate hairs with 7–15 rays; rays white to yellow, to 0.25 mm long. Branches terete to slightly quadrangular, young shoots with a moderately dense stellate indumentum, becoming glabrous as they age. *Leaves* 8–75 mm long, 4–40 mm wide in outline, with 1–7 leaflets, the leaflet number per leaf increasing along branches and then, on some plants, the younger distal leaves becoming unifoliolate; petiole 5–12 mm long, winged; rachis segments 9–11 mm long, 1–2 mm wide, winged, widest at the distal end or oval in shape; leaflets or unifoliolate leaves sessile to subsessile, elliptic to lanceolate, acute, attenuate, slightly discolourous, paler beneath, hairs concentrated on the midrib; terminal leaflet 15–51 mm long, 3–12 mm wide, longer than laterals; lateral leaflets 7–23 mm long, 4–10 mm wide. *Inflorescence* 3–7-flowered, with a moderately dense to dense stellate indumentum; peduncle 3–5 mm long; prophylls minutely unifoliolate, c. 1 mm long; metaxephylls minute; anthopodium 5–15 mm long. Sepals ovate-deltate, acuminate to acute, 2.5–3.5 mm long, 1.5–2 mm wide, not enlarging significantly as fruit matures; adaxial surface densely and minutely pubescent, becoming glabrous towards base; abaxial surface with a dense stellate indumentum. Petals pink, 5.5–8 mm long, 3–4.5 mm wide, not enlarging significantly as fruit matures; adaxial surface with a sparse simple and stellate indumentum, becoming glabrous towards base; abaxial surface with a moderately dense to dense stellate indumentum. Antesepalous filaments c. 2 mm long, prominently glandular on the distal 0.5 mm; antepetalous filaments smooth, c. 1.5 mm long; anther-apiculum large and erect. Disc sometimes surrounding base of filaments. Style glabrous or with few hairs at base. *Cocci* 4.5–5 mm long, 2–2.5 mm wide. Seeds 2.5–3.5 mm long, 1.5–2 mm wide. *Key's Boronia*.

*Additional specimens examined (of 11 collections):* QUEENSLAND; WIDE BAY DISTRICT: Como logging area, SF1004, c. 2 km along Harrys Hut Rd from Cooloola Way then c. 500 m W of forestry Rd, 26°12'S 152°58'E, *Beesley 951A* and *P. Ollerenshaw*, 10.xii.1986 (CANB, MEL); c. 30 km E of Gympie, 26°14'S 152°57'E, *B.A. Lebler*, 13.vii.1972 (AD, BRI, CANB, MEL, NSW); c. 30 km E of Gympie on disused road N of Cootharaba Hall, 26°13'S 152°58'E, *S.L. Everist 9851*, 13.vii.1972 (AD, BRI, CANB, MEL); Cooloola, 6.4 km NW of Lake Cootharaba, 26°1'-S 153°0'-E, *A.G. Harrold*, 4.ix.1971 (BRI); Kin Kin Ck, 19 km NNW of Tewantin, 26°14'S 153°00'E, *J.R. Telford 4326*, 29.vii.1976 (BRI, CANB, NSW, PERTH).

*Typification:* The type of this species has not been seen but Lebler (1972) states that a part of the original Keys collection is at BRI. Illustrations by Lebler (1972) leave no doubt about the application of this name.

*Notes:* *Boronia keysii* is not easily confused with any other species in south-eastern Queensland as it is the only one with large, glabrescent, pinnate leaves. It differs from *B. fraseri* by the slightly quadrangular stems, acuminate sepals, and the moderately dense to dense indumentum on the stems and inflorescence, and sometimes by having unifoliolate leaves. Spheroidal to vesiculose sclereids have been reported for this species (Rao and Bhattacharya 1981).

*Distribution and ecology:* *Boronia keysii* is restricted to the Lake Cootharaba area on the Cooloola sand mass, south-east Queensland (Fig. 7), where it is found growing in wet sclerophyll forest, sometimes with *Agathis*, often on recently disturbed sites. Flowering: April–December; fruiting: July–December.

*Conservation status:* Once thought possibly to be extinct after a lapse of 60 years since the first collection (Lebler 1972). The species is known from 13 populations and has a geographic range of approximately 18 km (Sandercoe 1992). Approximately one half of

the area occupied by this species is on private land with the remainder evenly divided between Como State Forest and Cooloola N.P. (Sandcreoe 1992). A ROTAP code of 2RVCi was given to this species by Briggs and Leigh (1996).

***Boronia* sect. *Valvatae*** subsect. *Valvatae* ser. 3. ***Rupicolae*** Duretto, ser. nov. Habitus exstensus vel pendulus. Flores parvi, flavo-virentes. Folia parva plana. *Sp. typica*: *B. rupicola* Duretto

Pendulous *shrubs*. Multiangular stellate hairs occasionally stalked; rays firm, straight, smooth and glossy. Peltate stellate hairs usually present on the abaxial surface of the leaves. *Leaves* imparipinnate, the younger distal leaves becoming unifoliolate; rachis segments oval or triangular shaped; lamina strongly discolourous, paler beneath, plane, adaxial surface glabrous or with a sparse indumentum, abaxial surface glabrous or with a hoary, heterogenous tomentum of two stellate types of hair: a moderately dense layer of multiangular stellate hairs, and a dense layer of smaller peltate hairs, the midrib not raised significantly on the abaxial surface, secondary thickening between midvein and abaxial epidermis. *Petals* yellow-green. Disc entirely within stamen whorl. Seed shiny or dull.

A monotypic series of the Northern Territory (Fig. 8) characterised by the pendulous habit, the small, green-yellow flowers, and the presence (usually) of both multiangular and peltate stellate hairs on the abaxial surface of the leaves.

20. ***Boronia rupicola*** Duretto, *Nuytsia* 11: 336 (1997), figs 13 A-G. *Type*: 18 km SE of Jabiru, outlier of main Plateau, 12°48'S 132°55'E, L.A. *Craven* 6646, 30.iii.1981 (holotype CANB 338121; isotypes A, AD, BRI, CANB 338122, DNA, E, L, MEL 234383).

*Boronia* A44419 (Nabarlek) *sensu* Leach *et al.* (1992, p. 35); Dunlop *et al.* (1995, p. 100).

*Boronia* DNA17279 (Radon Gorge) *sensu* Leach *et al.* (1992, p. 35); Dunlop *et al.* (1995, p. 100).

*Boronia* sp.5 (Nabarlek; *T.G. Hartley* 13819) *sensu* Briggs and Leigh (1996, p. 167).

*Boronia* sp.6 (Radon Gorge; *C.R. Dunlop* 5455) *sensu* Briggs and Leigh (1996, p. 167).

Pendulous *subshrub* to 40 cm long, resprouting from rootstalk. Simple hairs (mainly on leaves) erect, 0.01–0.02 mm long. Multiangular stellate hairs with c. 10–20 rays, occasionally stalked; rays white to faintly yellow, to 0.05(–0.1) mm long. Branches brittle, quadrangular, glabrous or with a dense stellate indumentum, becoming glabrous as they age. *Leaves* simple or imparipinnate with 1–7 leaflets, the younger distal leaves becoming unifoliolate; petiole 1.5–7 mm long; rachis segments 4–7 mm long 0.5–1 mm wide; simple and unifoliolate leaves sessile to subsessile, 5–15 mm long, 1–4 mm wide, elliptical to oblanceolate, obtuse, attenuate to obtuse; adaxial surface smooth, glabrous or with a sparse indumentum of multiangular stellate hairs and minute erect simple hairs; abaxial surface glabrous or with a dense indumentum of a heterogenous layer of two types of hair: a sparse to moderately dense layer of multiangular hairs (some stalked) and a dense layer of smaller peltate stellate hairs; terminal leaflet 7–10 mm long, 1–3 mm wide, longer than preceding laterals but otherwise shortest; lateral leaflets 4–10 mm long, 1–3 mm wide. *Inflorescence* 1(–3)-flowered, with a dense stellate indumentum; peduncle



0.5–1 mm long; prophylls linear to minutely unifoliolate, 1–6.5 mm long, 0.5–1.5 mm wide, indumentum as with leaves; metaxyphylls minute to 0.5 mm long; anthopodium 0.5–3 mm long. Sepals ovate-deltate, acute to slightly acuminate, 1–1.5 mm long, c. c. 1 mm wide, not enlarging significantly as fruit matures; adaxial surface with a sparse simple indumentum, becoming glabrous towards base; abaxial surface with a sparse to dense stellate indumentum. Petal yellow-green, 2–2.5 mm long, c. 1.5 mm wide, not enlarging significantly as fruit matures, midvein slightly raised on the abaxial surface; adaxial surface with a sparse simple indumentum, becoming glabrous towards base; abaxial surface with a sparse to dense stellate indumentum. Antesepalous filaments c. 1.5 mm long, prominently glandular on the distal 0.5 mm; antepetalous filaments smooth or slightly glandular distally, 1 mm long; abaxial surface of anther not frosty, anther-apiculum absent or present, erect. Style hirsute at base. *Cocci* c. 3.5 mm long, c. 2 mm wide, glabrous to moderately hirsute. Seeds 2.5–3 mm long, 1–1.5 mm wide, black or grey, shiny, sometimes becoming dull.

*Selected specimens examined (of eight collections):* THE NORTHERN TERRITORY; DARWIN and GULF COUNTRY: 11.5 km ESE of Nabarlek, c. 12°20'S 133°26'E, *K. Brennan* 2365, 13.vi.1993 (CANB, DNA, MEL, OSS); Tin Can Ck c. 20 miles S of Nabarlek Mining Camp, 12°28'S 133°15'E, *T.G. Hartley* 13819, 30.v.1973 (CANB, DNA); Radon Gorge, Mt Brockman, 12°45'S 132°54'E, *C.R. Dunlop* 5455, 21.iv.1980 (DNA, NSW); 6.5 km SSW of Mt Brockman,

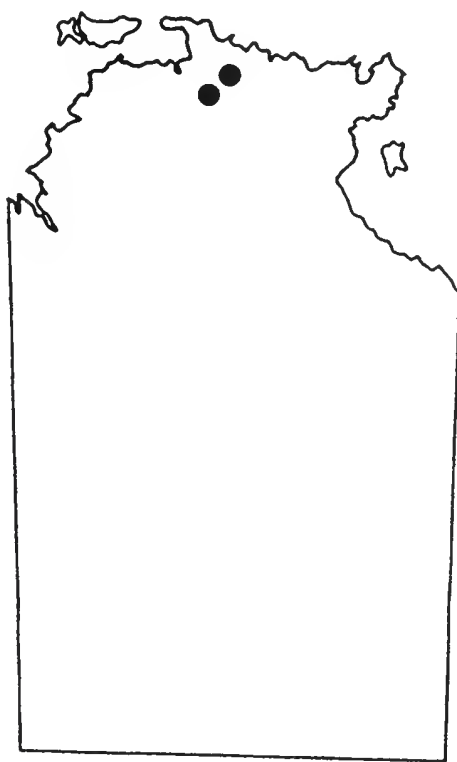


Fig. 8. Distribution of *Boronia* series *Rupicolae*: *B. rupicola* (●).

Kakadu NP, 12°48'S 132°56'E, I.R. Telford 8058 and J.W. Wrigley, 23.iv.1980 (CANB); Baroalba Ck, K. Brennan 142, 31.iii.1990 (OSS).

*Notes:* Some plants of *B. rupicola* are glabrous while others are hirsute and detailed population surveys are required to ascertain the taxonomic importance of this (Duretto 1997). *Boronia rupicola* can be distinguished from *B. lanceolata* and from the other Arnhem Land cliff specialists (*B. viridiflora* and *B. suberosa*) by the pendulous habit and compound leaves (not always present) and the very small flowers (Duretto 1997).

The position of *B. rupicola* within *Boronia* subsect. *Valvatae* is uncertain and the species is certainly isolated. Though the cladistic analysis of Duretto and Ladiges (1999) places this species sister to *Boronia* series *Erianthae* it shares the peltate stellate hairs with *Boronia* series *Valvatae* and maybe be sister to this series.

*Distribution and ecology:* *Boronia rupicola* is known only from the Mt Brockman outlier (Kakadu N.P.) and around Nabarlek (Arnhem Land), Northern Territory (Fig. 8). This pendulous shrub is found exclusively on vertical surfaces in heavily dissected sandstone areas. The pendulous habit on vertical rock faces is found in other species of the dissected sandstone country of north-eastern Arnhem Land, e.g. *Ochrosperma sulcatum* A.R. Bean (Myrtaceae; Bean 1997): this phenomenon warrants further study (see also *B. viridiflora*, species 44 below). Flowering and fruiting: March-July.

*Conservation status:* 2RC- (Duretto 1997).

***Boronia* sect. *Valvatae* subsect. *Valvatae* ser. 4. *Valvatae* Benth., *Fl. austral.* 1: 308, 311 (1863). *Sp. lectotypica* (here designated): *B. alulata* Benth.**

Erect, rarely sprawling, *shrubs*. Multiangular stellate hairs sessile; rays firm, straight, smooth and glossy, often becoming weak, flexuous and dull on adaxial leaf-surface. *Leaves* simple or unifoliate or imparipinnate, strongly discolourous, paler beneath, the margins plane to revolute, the midrib raised on the abaxial surface, sometimes barely; adaxial surface glabrous or with a sparse to dense stellate indumentum; abaxial surface with a hoary, heterogenous tomentum of two types of hair: a sparse to moderately dense layer of multiangular stellate hairs, and a dense layer of smaller peltate hairs, peltate hairs rarely absent (*B. glabra* [most plants], *B. mollis*); rachis segments oval or triangular. Disc usually glabrous and entirely within stamen whorl. *Seed* shiny, rarely dull (*B. hoipolloi*, *B. lanceolata*).

*Boronia* series *Valvatae* contains 22 species that are found in the 'Top End' of the Northern Territory, Queensland, New South Wales and eastern Victoria (Figs 9-13). The series is characterised by the strongly discolourous leaves that have a dense indumentum of two types of stellate hair on the abaxial surface of the leaves (except *B. mollis*, *B. glabra*). A taxonomically difficult group requiring further work. The relationships between the species of this series are not clearly apparent (cf. Duretto and Ladiges 1999) and the informal classification presented here reflects this. Two species, *B. ledifolia* and *B. chartacea*, were isolated in the cladistic analysis of Duretto and Ladiges (1999) and are treated here as *incertae sedis*.

*Typification:* *Boronia alulata* is chosen as the type species for *Boronia* ser. *Valvatae* as it was probably the first species of the series to be collected (by Banks and Solander in 1770, see below) and was one of the species described by Benthham (1863).

**21. *Boronia ledifolia* (Vent.) DC., *Prodr.* 1: 722 (1824). *Lasiopetalum ledifolium* Vent., *Jard. Malmaison* 1 sub. 59 (1804). *Type:* not designated. (sp. group *incertae sedis*).**

*Eriostemon paradoxus* Sm., *Rees Cycl.* 13 No. 6 (1809). *Boronia?* *paradoxa* (Sm.) DC., *Prodr.* 1: 722 (1824). *Type Citation:* "Sent from Port Jackson, New South

Wales, by Dr. White." *Type*: New South Wales, *Mr White*, 1791 (syntype LINN 755.10 *n.v.* (transparency MEL 2041299); Port Jackson, New South Wales, *Mr White*, 1795 (syntype LINN 755.11 *n.v.* (transparency MEL 2041297), LINN 755.12 *n.v.* (transparency MEL 2041298)).

*Boronia triphylla* Sieber ex Rchb., *Iconogr. bot. exot.* 1: 53 t. 73 (1825). *B. ledifolia* var. ? *triphylla* (Sieber ex Rchb.) Benth., *Fl. austr.* 1: 314 (1863). *Type citation*: "Sieb. Fl. Nov. Holl. exsicc. no. 297. ...in Nova Hollandia, crescit in montibus caeruleis, mill. angl. 2, ante Springwood sub altissimis Eucalyptis." *Type*: Nova Hollandia, *Sieber* 297 (isosyntypes MEL 258131, MEL 258134 right hand spec., MEL 258364 left hand spec., TCD).

*Boronia triphylla* Sieber ex Spreng., *Syst. veg.* 4: 148 (1827). *Type citation*: "Nov. Holl." *Type*: Nova Hollandia, *Sieber* 297 (isosyntypes MEL 258131, MEL 258134 right hand specimen, MEL 258364 left hand specimen, TCD); *ibid*, *Sieber* 531 (isosyntypes MEL 258134 left hand spec., MEL 258364 right hand spec.) *nom. illeg.* non Sieber ex Rchb.

*Boronia triphylla* var. *latifolia* Lindl., *Edwards's Bot. Reg.* 27 (1841), t. 47. *Type citation*: "New Holland shrub... The accompanying drawing was made in the Nursery of Mssrs. Loddiges." *Type*: *n.v.*, description and plate decisive.

*Boronia ledophylla* F. Muell., *Fragm.* 1: 67 (1859). Based on *B. ledifolia sensu* Bartling in Lehmann, *Pl. Preiss* 2: 226 (1848). *Type citation*: "In regionibus interioribus Australiae meridionali-occidentalis m. Octobri a. 1840. Herb. Preiss. No. 2644." *Type*: *Preiss s.n.* (syntype LUND *n.v.* (Paul Wilson pers. comm.)).

*Boronia ledifolia* var. *pinnata* Domin, *Beitrage zur Flora und Pflanzengeographie Australiens* 838 (1926) [=*Bibliotheca Botanica* Heft 89 (1926)]. *Type citation*: "N.S. Wales: Emmaville, J.L. Boorman VI. 1904. ..." *Type*: N.S. Wales, Emmaville, *J.L. Boorman*, vi.1904 (isosyntype MEL 249193).

*Boronia ledifolia* var. *normalis* Domin, *Beitrage zur Flora und Pflanzengeographie Australiens* 838 (1926) [=*Bibliotheca Botanica* Heft 89 (1926)]; *nom. inval.*, autonym. *Type citation*: "Sieber FL. Novae Holl. Nr. 303 und Fl. mixta No. 534". *Type*: Nov. Holl., *Sieber* 303 (isosyntypes CANB, MEL 258361, MEL 258365); Nov. Holl., *Sieber* 534 (isosyntype MEL 258360, MEL 258363).

*Boronia whitei* Cheel, *J. Proc. Roy. Soc. New South Wales* 61: 405 (1928). *Type Citation*: "This was originally collected at Tent Hill, New England, by Mr. E.C. Andrews in 1903, ... There are also specimens from Emmaville (J.L. Boorman, June, 1904); Torrington (R.H. Cambage, Nos. 1609 and 1715, July and September, 1907) ... also from Torrington collected by J.L. Boorman in November, ... Then we have specimens from Bismuth, via Torrington, collected by Mr. A. McNutt in August, 1912 and 1924 ..." *Types*: Tent Hill, New England, *Mr. E.C. Andrews*, 1903 (syntype NSW 48863); Emmaville, *J.L. Boorman*, June 1904 (syntype MEL 249193); Torrington, *R.H. Cambage* 1609, July 1907 (NSW? *n.v.*); Torrington, *R.H. Cambage* 1715, [29.]Sept. 1907 (syntypes BRI AQ318436, MEL 249194, NSW 488652); Bismuth, via Torrington, *Mr. A. McNutt*, August 1912 (syntype NSW 218867); Bismuth, via Torrington, *Mr. A. McNutt*, August 1924 (syntype NSW? *n.v.*).

*Boronia rosmarinifolia* var. *albiflora* Cheel, *J. Proc. Roy. Soc. New South Wales* 61: 412 (1928). *Type citation*: no specimens cited but Cheel refers to specimens cited in Anon., *Proc. Linn. Soc. New South Wales* 45: 473 (1920) [erroneously refers to Anon., *Austral. Naturalist* 2: 205 (1913)], viz. “from Hill Top (E. Cheel, July, 1914), Bell (Miss H. Gregson, Sept., 1914), Mount Wilson (J. H. Maiden, Dec., 1914), near Cowan Station (W. F. Blakely & D. W. C. Shireess, Sept., 1919)”. *Type*: Hill Top [34°22’S 150°30’E, NSW], E. Cheel, 20.vii.1914 (syntype NSW 419856); Bell [33°30’S 150°16’E, NSW], Miss H. Gregson, ix.1914 (syntype NSW 419847); Mount Wilson (halfway from Bell) [33°30’S 150°19’E, NSW], J.H. Maiden, 19.xii.1914 (syntype NSW 419849); 2 miles N. W. of Cowan Station [33°33’S 151°09’E, NSW], W.F. Blakely & D.W.G. Shireess, 8.ix.1919 (syntype NSW 419848).

*Boronia triphylla* var. *flore-plena* Cheel, *J. Proc. Roy. Soc. New South Wales* 61: 412 (1928). *Type citation*: no specimens cited but Cheel refers to specimen cited in Anon., *Proc. Linn. Soc. New South Wales* 45: 473 (1920) [erroneously refers to Anon., *Austral. Naturalist* 2: 205 (1913)], viz. “Lindfield (E.G. Jacobs, Aug., 1913)”. *Type*: Lindfield [33°46’S 151°10’E, NSW], E.G. Jacobs, 9.viii.1913 (holotype NSW 419854).

*Illustrations*: J. Lindley, *Edwards’s Bot. Reg.* 27, t. 47 (1841); J. Paxton, *Paxton’s Mag. Bot.* 8: opp. 123 (1841); S. Macoboy, *What Flower is That?*, 59 (1968); A.M. Blomberry, *What Wildflower is That?*, 68 (1973); S. Macoboy and A. Blomberry, *Australia Complete Book of Flowers*, 72, Fig. 209 (1975); L. Costermans, *Native Trees and Shrubs of South-Eastern Austral.*, 199 (1983); M. Baker *et al.*, *Native Plants of the Upper Blue Mountains*, 27 (1984); W.R. Elliot and D.L. Jones, *Encyclopedia of Australian Plants* 2nd ed., 344 (1985); L. Cronin, *Concise Austral. Fl.*, 79, 80 (1989, as *B. whitei*); A. Fairley and P. Moore, *Native Plants of the Sydney District*, 233, t. 805 (1989); L. Robinson, *Field Guide to the Native Plants of Sydney*, 114, 115 (1991); P.H. Weston and M. Porteners, *Fl. New South Wales* 2: opposite p. 187, and pp. 231, 232 (1991).

Erect, much branched *shrub* to 2.5 m tall, resprouting from rootstalk. Multiangular stellate hairs with c. 6–20 rays; rays white to red-brown, to 0.1(–0.3) mm long. Branches with a dense stellate indumentum, becoming glabrous as they age. *Leaves* simple or imparipinnate with 1–11 leaflets, the leaflet number per leaf increasing along branches, the younger distal leaves sometimes becoming unifoliolate, firm, not obviously glandular; petiole 2–11 mm long, winged; rachis segments 2–7 mm long, 0.5–2 mm wide, winged, elliptical; simple or unifoliolate leaves 3–50 mm long, 1–7 mm wide; imparipinnate leaf in outline 7–50 mm long, 5–45 mm wide; leaflets and simple or unifoliolate leaves elliptic or narrowly elliptic, acute to obtuse, attenuate; adaxial surface with a sparse stellate indumentum; the margins revolute or recurved, or plane with simple leaves; the midrib raised on the abaxial surface; terminal leaflet 3–43 mm long, 1–5 mm wide, longer than lateral leaflets; lateral leaflets 3–25 mm long, 1–5 mm wide. *Inflorescence* 1–3(–5)-flowered, with a dense stellate indumentum; peduncle 1–10 mm long; prophylls minutely unifoliolate or minutely imparipinnate, 0.5–3.5 mm long, c. 0.5(–2) mm wide, sometimes leaf like; metaxyphylls usually minute, sometimes approaching 1.5 mm long; anthopodium 4–11 mm long. Sepals narrowly ovate-deltate to elliptical, acute, 3–4 mm long, 1.5–2.5 mm wide, enlarging to 4–4.5 mm long and 3–3.5 mm wide as fruit matures; adaxial surface densely and minutely pubescent, becoming glabrous towards base; abaxial surface with a dense stellate indumentum. Petals



(5–)8.5–12 mm long, (2.5–)3–6 mm wide, enlarging slightly as fruit matures; adaxial surface sparsely simple pubescent and sometimes becoming glabrous towards base; abaxial surface with a moderately dense to dense stellate indumentum. Antesepalous filaments c. 2 mm long, prominently glandular on the distal 0.5–1 mm; antepetalous filaments slightly tuberculate, c. 1.5 mm long; anther-apiculum absent or minute. Disc not or occasionally surrounding base of filaments, glabrous or with occasional stellate hair. Style glabrous, or rarely with few hairs. *Cocci* 4–5 mm long, 2–3 mm wide, glabrous to glabrescent, or with a sparse to dense indumentum. Seeds 3–4 mm long, 2–2.5 mm wide. *Ledum Boronia*, *Showy Boronia*, *Sydney Boronia*, or *Labrador Tea-leaved Boronia*.

*Selected specimens examined (of c. 130 collections):* NEW SOUTH WALES: NORTHERN TABLELANDS: Tent Hill-Torrington Rd, 10 miles W of Deepwater, *E.F. Constable*, 13.v.1961 (BRI, MEL, NSW); 3.1 km ENE of Emmaville on road to Deepwater, 29°26' 30"S 151°37' 30"E, *N.G. Coveny 14641*, *R.O. Makinson* and *A.L. Quince* (NSW); NORTH COAST: Myall Lakes, 32°32'S 152°12'E, *R. Bates 2197*, ix.1982 (AD); CENTRAL WEST SLOPES: Munghorn Gap, *H.S. McKee*, 1.x.1952 (NSW); CENTRAL TABLELANDS: 5 km from Bells Line of Rd, on second Paterson Range Rd, Blue Mts, 33°27'S 150°43'E, *P. Hind 5391*, *R. Ball* and *A. Copp*, 14.x.1987 (MEL, NSW); 4 km along walking track from Riverveiw Ford to Bundanoon Ck, Moreton NP, 34°41'S 150°19'E, *S.R. Corbett 169*, ix.1987 (NSW); CENTRAL COAST: Boggy Swamp Ck, Putty-Howes Valley Rd, c. 13 miles SW of Howes valley, *E.F. Constable*, 28.viii.1957 (NSW); Orchard near Quarry on track from Arcadia and Marramara Ck, 33°33'S 151°04'E, *D. Albrecht 2145* (MEL, NSW); SOUTHERN TABLELANDS: Budawangs NP, 22 km ESE of Braidwood, 4 km SE of Mt Budawang, 35°31'S 150°02'S, *I.R. Telford 8823* and *L. Lockwood*, 14.viii.1992 (CANB, NSW); Spur N of Wadbilliga Mtn, *J. Olsen 2369*, 13.x.1974 (NSW); SOUTH COAST: Southern Huskisson to Broadwood Rd, 30 km W from its crossing of Highway 1, 35°03'S 150°34'E, *N.G. Walsh 1408*, 26.viii.1984 (CANB, MEL, NSW); 20 km from Tomerong on Turpentine Rd, 35°20'S 150°28'E, *F.W. Howe 68*, 12.ix.1983 (AD, CANB, MEL, NSW); Rocky outcrop on E side of Donalds Ck, c. 2 km upstream from the confluence with Burra Ck, 35°55'S 149°59'E, *D. Albrecht 3979*, 24.v.1990 (MEL); Dampier SF, Little Sugarloaf Rd, 3.5 km W of the Western Boundry Rd intersection, 36°01'S 149°58'E, *D.E. Albrecht 4784*, 7.x.1991 (CANB, MEL, NSW); VICTORIA - EAST GIPPSLAND: Mt Elizabeth Natural Feature scenic reserve, W33, Gippsland Lakes hinterland study area, sector G, subblock 32A, *A.C. Beauglehole 77124*, 17.ix.1984 (MEL); 11.6 km SE (160°) Campbells Knob, 2.5 km ESE (110°) Junction of Mountain Ck (Broadbent R.) and Snowy R., 37°18'S 148°23'E, W18, *S.J. Forbes 172*, 12.ix.1979 (MEL); "The Playground" near junction of Tambo and Timbarra R.'s, a short way uphill, c. 12 miles W of Buchan, *J. Galbraith*, xi.1963 (MEL); Museum Spur, falling E to Snowy R., below helipad, N facing slope, 37°18' S 141°21' E, *N.G. Walsh 2211*, 15.xi.1988 (MEL).

*Typification and authority:* No specimens were cited with the protologue of *Lasiopetalum ledifolium* Vent. but from descriptions and specimens in de Candolle's herbarium there is no doubt on the application of this name. Some workers (for example Willis 1978, Weston and Porteners 1991) give the authority of *B. ledifolia* as (Vent.) J.Gay. Gay (1821) transferred the species to *Guichenotia* J.Gay and not *Boronia*, and Candolle (1824), referring to Gay (1821), makes the accepted combination (Chapman 1991).

*Synonymy:* The majority of names placed in synonymy under *B. ledifolia* were described from specimens at different stages of leaf development (see *Notes*) and require no further discussion. Some though do warrant some discussion.

Bartling (1848) discussed a Preiss specimen (*n. 2644*) of *B. ledifolia* which he possibly erroneously presumed was from Western Australia as were most of Preiss's collections. Mueller (1859) did not think this specimen could be assigned to *B. ledifolia* as *B. ledifolia* is an eastern Australian taxon, and so he nominated the name *B. ledophyllae* for it without seeing the specimen. Paul Wilson (pers. comm., 1995) has seen a Preiss collection (*s.n.*, LUND) of *B.*

*ledifolia* that is the typical form found around Sydney. This is probably the specimen referred to by Bartling and here *B. ledophyllae* is placed in synonymy under *B. ledifolia*.

Cheel (1928) described *B. rosmarinifolia* var. *albiflora* and stated that specimens of this taxon were first recorded by him on p. 205 in the April Ordinary Meetings of the New South Wales Naturalists' Club (see Anon. 1913). In the minutes of this meeting it was recorded that Mr Cheel presented a few specimens of *Boronia* for discussion but no reference to *B. rosmarinifolia* or *B. ledifolia* was made. Cheel (1913) does have an article in that journal in which he discussed a white-flowered form of *B. serrulata* Sm. (*l.c.*, p. 208). Later, at a meeting of the Linnean Society on the 27th of October, 1920, Cheel does present white-flowered specimens of a taxon that he called *B. ledifolia* var. *rosmarinifolia* (Anon. 1920). It would appear that Cheel (1928) cited the wrong paper. The specimens of *B. ledifolia* var. *rosmarinifolia* Cheel exhibited at the meeting of the Linnean Society (Anon. 1920) were all from the Central Coast area of New South Wales where *B. rosmarinifolia* is not found. Of these collections, one, a collection from Mt Wilson made by J.H. Maiden in December 1914, has been located at NSW. This specimen is referable to *B. ledifolia*.

Cheel (1928) also described *B. triphylla* var. *flore-plena* and, as with *B. rosmarinifolia* var. *albiflora*, referred to specimens cited in Anon. (1913, p. 205) when it would appear that his intentions were to refer to the specimen cited in Anon. (1920, p. 473). This specimen has not been seen but as it is from the Sydney area and was included in Cheel's concept of *B. triphylla* it can be safely assumed to be referable to *B. ledifolia*.

*Notes:* *Boronia ledifolia* exists in a multiplicity of vegetative forms (see discussions in Maiden and Betcher 1903; Weston 1990; Weston and Porteners 1991) and was also the first species of a difficult complex of species to be described. Due to these two facts a large number of taxa have been described as varieties of *B. ledifolia*, or at some stage been considered synonymous with *B. ledifolia*. Many of these taxa were later elevated to specific rank or 'lost' in the literature. Most new taxa described on the east coast of Australia are compared to *B. ledifolia*. Conversely specimens of *B. ledifolia* have also been described as a number of species in three genera in two families (see synonyms, above). The various vegetative forms of *B. ledifolia* are attributable to a complex ontogenetic sequence in leaf development. Initially seedlings, or new shoots, have simple leaves as with most members of *Boronia* sect. *Valvatae*. Plants soon develop imparipinnate leaves with narrow and revolute leaflets, and trifoliolate leaved plants are common. As the plants age further they may produce simple leaves again: the typical form. Smith (1809) was the first to note the variation in leaf structure shown by *B. ledifolia*. When he described *Eriostemon paradoxus* (= *B. ledifolia*) Smith (1809) based his description on three specimens at different ontogenetic stages: there was a simple-leaved specimen (LINN 755.10), one that was ternate (Linn 755.11) and one that was 3–5-foliolate (LINN 755.12). He concluded that: "The pinnate and ternate kinds are unquestionably but varieties of each other, nor can we think the first a distinct species, however paradoxical our opinion may seem. The flowers are all exactly alike."

Compounded with this ontogenetic variation in leaf form, *B. ledifolia* shows some other variation: the disjunct Northern Tableland populations consist of small imparipinnate leaved plants with very narrow leaflets (this form has been described as *B. whitei* and *B. ledifolia* var. *pinnata*); while populations south of Sydney consist of tall plants with larger flowers and are usually simple leaved. Both variants are found together in the Sydney and Blue Mountain regions. There may be a cline between these two extremes. *Boronia ledifolia* may also intergrade with *B. angustisepala* around Scone (see *B. angustisepala*, species 23 below). This taxon needs further study that includes field research monitoring populations over a number of years.

An isolated collection of *B. ledifolia* from central Queensland is lodged at MEL:

'Pioneer River, Queensland, Dr. Griffith, 1889 (MEL 250922)'. The Pioneer River has its mouth at Mackay (central Queensland; Fig. 9) and no members of *Boronia* sect. *Valvatae* have been collected within 300 km of this area. It is possible that Griffiths collected the specimen from the Clark Range (west of Mackay) or in any one of the hundreds of rainforest and wet sclerophyll remnants in the area. Having simple and petiolate leaves suggests affinities to the *B. foetida* species-group but the narrow leaves with a sparse indumentum on the adaxial surface suggests it is an extreme form of *B. ledifolia*. Quite possibly the sheet was mislabelled and came from Victoria where Dr Griffith did collect (unpublished notes on collectors, MEL).

Another collection of geographical interest was made by Dr Finselbach (Tweed River, Dr W. Finselbach, July 1892, MEL 255246) which, if the locality information is correct, would extend the range of *B. ledifolia* to northern, coastal New South Wales. At the National Herbarium of Victoria there are a number of collections made by Finselbach from the Tweed River and so this provenance should not be dismissed as erroneous.

*Boronia ledifolia* can be distinguished from *B. chartacea* by having smooth margins; from the members of the *B. alulata* species-group and *B. duiganiae* by small, ovate-deltate sepals; from *B. lanceolata* by pilose filaments; from *B. odorata* by longer peduncles and petals; from members of the *B. rosmarinifolia* species-group by petiolate leaves; and from members of the *B. foetida* species-group by smaller, acute sepals and the sparse indumentum on the adaxial surface of the petals.

A chromosome number of  $n=16$  has been recorded by Smith-White (1954), see also Stace *et al.* (1993).

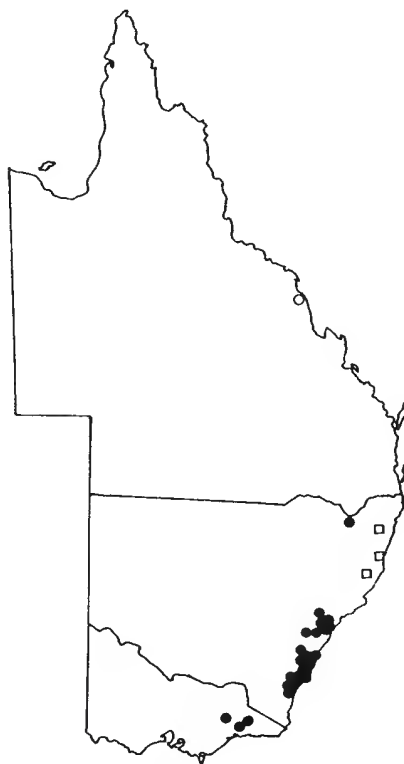


Fig. 9. Distribution of *Boronia* series *Valvatae* in part: *B. ledifolia* (●), location of Pine River mouth (O), *B. chartacea* (□).

*Distribution and ecology:* *Boronia ledifolia* is common and widespread in New South Wales from Tenterfield to Eden; and is known from few small populations in East Gippsland of Victoria (Fig. 9). The species is found in heath and dry sclerophyll forest on sandstone and granite and can be locally dominant. Flowering: June–November; fruiting: October–December.

The taxon called *B. ledifolia* by Neldner (1992) and Ross (1994) in southern Queensland is either *B. duiganiae* or *B. odorata*; that referred to as *B. ledifolia* by Tennyson-Woods (1882) in north Queensland is probably a species of *Zieria*. Jessop (1983) lists *B. ledifolia* as part of the flora of Lake Eyre Basin, South Australia. A mixed collection of *B. ledifolia* and *B. glabra* (Schomburgk s.n. AD 96250177) is lodged at AD and the locality information is assumed to be incorrect.

*Conservation status:* In New South Wales *B. ledifolia* is common, widespread and found in several reserves; but in Victoria the species is restricted and vulnerable (Gullan *et al.* 1990).

**22. *Boronia chartacea*** P. H. Weston, *Telopea* 4: 123 (1990). *Type:* New South Wales; North Coast; Newry State Forest, 1.9 km S of Urunga, 30°32'S 152°58'E, R.G. Coveny 4603, 13.ix.1972 (holotype NSW; isotypes AD 98344142, BRI AQ384983, CANB 333153, K n.v., MEL 1620695, NSW 372773, PERTH n.v.). (sp. group *insertae sedis*).

*Boronia* sp. C (aff. *rosmarinifolia*) *sensu* Jacobs and Pickard (1981, p. 191).

*Boronia* sp. aff. *rosmarinifolia* A. Cunn. (Constable 66836 NSW) *sensu* Rao and Bhattacharya (1981, p. 17).

*Illustrations:* P.H. Weston and M.F. Porteners, *Fl. New South Wales* 2: 232 (1991).

Erect much branched *shrub* to 2.8 m tall, resprouting from rootstalk. Multiangular stellate hairs with 6–15 rays; rays white to yellow, 0.1–0.25 mm long. Branches with a sparse to dense stellate indumentum, becoming glabrous as they age. *Leaves* simple, chartaceous, 8–45 mm long, 1.5–5 mm wide; petiole 0.5–2 mm long; lamina elliptical to narrowly elliptical, obtuse, attenuate, the margins finely glandular warty, plane to recurved and sometimes revolute on drying; adaxial surface glabrous or with few hairs on the midrib. *Inflorescence* 1-flowered, with a sparse to dense stellate indumentum; peduncle to 1 mm long; prophylls minutely unifoliate, 1–2 mm long, c. 0.5 mm wide; metaxyphylls minute; anthopodium 4–6 mm long. Sepals ovate-deltate, acute, 2–2.5 mm long, 1–1.5 mm wide, not enlarging significantly as fruit matures; adaxial surface densely and minutely pubescent, becoming glabrous towards base; abaxial surface with a dense stellate indumentum. Petals 6–9 mm long, 3–4 mm wide, enlarging slightly as fruit matures; adaxial surface sparsely simple pubescent; abaxial surface with a moderately dense to dense stellate indumentum. Antesepalous filaments c. 1.5 mm long, prominently glandular on the distal 0.5 mm; antepetalous filaments tuberculate, c. 1 mm long; antepetalous anther  $\pm$  slightly larger than antesepalous anther before dehiscence; anther-apiculum absent or minute. Disc glabrous, not (or rarely slightly) surrounding base of filaments. Style glabrous. *Cocci* 4–4.5 mm long, 2.5–3 mm wide, glabrous to glabrescent with few simple erect hairs along suture. Seeds 3.5–4 mm long, 2–2.5 mm wide.

*Selected specimens examined* (of 12 collections): NEW SOUTH WALES; NORTH COAST: Just before Whiteman Ck crossing on road to Coaldale from Grafton, c. 29°27'S 152°50'E, M.F. Duretto 105–107 and A.S. Jenz, 7.i.1992 (MEL); Bril Bril Ck, Bellangry Forest, 20 miles NW of Wauchope, 31°17'S 152°37'E, E.F. Constable 66836, 15.x.61 (NSW, PERTH); The 'Punchbowl'



near Copmanhurst, 29°35'S 152°46'E, *D.M. O'Grady*, viii.1970 (NSW); Cabbage tree Ck, Wimpeyree near Casino, 29°13'S 152°48'E, *S. Benson* 124 and *Dodson*, 4.vi.1984 (NSW); Pie Mountain Ck, Kippara SF, 9435-566454, 31°13'S 152°32'E, *D. Binns*, 23.xii.1986 (NSW); Wilson R. above Wild Bull Picnic area, 31°15'S 152°31'E, *T. and J. Whaite* 3680, 24.viii.1980 (NSW); Upper Rolah Plains, 31°15'S 152° 38'S, *B. Lane*, 11.ix.1956 (NSW).

*Notes:* *Boronia chartacea* can be distinguished from all other species in *Boronia* sect. *Valvatae* by its thin papery leaves with glandular margins; it also differs from *B. rosmarinifolia*, with which it is sympatric in the Grafton-Copmanhurst area, by its petiolate leaves.

*Distribution and ecology:* *Boronia chartacea* occurs in the Grafton-Copmanhurst and Wauchope areas, New South Wales (Fig. 9), where it is found in moist gullies and along creeks in wet and dry sclerophyll forest over sandstone and granite. Flowering and fruiting: August-January.

*Conservation status:* 3R (Briggs and Leigh 1996).

### ***Boronia alulata* species-group**

*Branches* with a sparse to dense stellate indumentum, becoming glabrous as they age. *Leaves* petiolate, imparipinnate, the younger distal leaves not becoming unifoliolate, adaxial surface glabrous or with a sparse, stellate indumentum; the midribs raised on the abaxial surface and impressed on the adaxial surface, with secondary thickening between the midvein and the abaxial epidermis; leaflets with margins slightly recurved to revolute. *Prophylls* minutely unifoliolate to minutely imparipinnate. Sepals narrowly ovate-deltate to narrowly deltate (except *B. umbellata*), acute, adaxial surface densely and minutely pubescent and becoming glabrous towards the base, abaxial surface with a moderately dense indumentum, often dark in colour. Petal adaxial surface with a sparse simple indumentum. Disc sometimes swollen and surrounding base of filaments, glabrous or stellate-glabrescent.

Eight species from north Queensland to central New South Wales (Fig. 10) are placed in this informal group: all have imparipinnate leaves that have raised midribs with secondary thickening on the abaxial surface, and narrowly deltate sepals (except *B. umbellata* which has a swollen disc like *B. mollis*).

23. *Boronia angustisepala* Durretto, sp. nov. A *Boronia ledifolia* (Vent.) DC. sepalis ovatis-triangularis anguste, et a *B. amabilis* S.T. Blake foliolis longioribus (5–25 non 3–18 mm longis), et *B. umbellata* P.H. Weston foliolis angustioribus (2–9 non 8–15 mm latis) differt. Type: Murrumbidgee Cascades, Gibraltar Range N.P., Northern Tablelands, New South Wales, 29°32'29"S 152°21'32"E, *M.F. Durretto* 673, *P. Neish* and *I. Thompson*, 25.x.1995 (holotype MEL 2043157; isotypes BRI, CANB, MEL 2043158, NSW, PERTH).

*Boronia rubiginosa sensu* (for example) Jacobs and Pickard (1981), Weston *et al.* (1984), Weston (1990), Weston and Porteners (1991), Durretto (1995), Briggs and Leigh (1996), Durretto and Ladiges (1999) *non* A.Cunn. ex Endl.

*Boronia* sp. D (*aff. rubiginosa*) *sensu* Jacobs and Pickard (1981, p. 191).

*Illustrations:* P.H. Weston and M. Porteners, *Fl. New South Wales* 2: opposite p. 187, and p. 231 (1991, as *B. rubiginosa*).

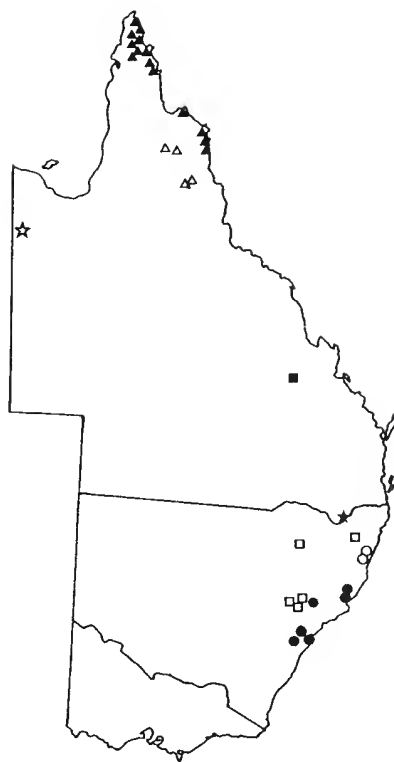
Erect, much branched *shrub* to 1.5 m tall. Multiangular stellate hairs with c. 6–20 rays;

rays white to red-brown, 0.25–0.75(–1) mm long. Branches with a dense, stellate indumentum, becoming glabrous as they age. *Leaves* 10–55 mm long, 3–30 mm wide in outline, with (1–)3–11 leaflets, the leaflet number per leaf increasing along branches; petiole 2–5 mm long, winged; rachis segments 3–9 mm long, 1–2 mm wide, winged, elliptical; leaflets sessile to subsessile, elliptic to spatulate, obtuse, adaxial surface with a sparse stellate indumentum; terminal leaflet 6–25 mm long, 3–9 mm wide, longer than laterals; lateral leaflets 5–16 mm long, 2–7 mm wide. *Inflorescence* 1–3-flowered, with a dense, stellate indumentum; peduncle 2–5 mm long; prophylls minutely unifoliate, 0.5–3 mm long, c. 0.5 mm wide; metaxyphylls minute; anthopodium 4–13 mm long. Sepals 3–6 mm long, 1–2 mm wide; abaxial surface with a moderately dense stellate indumentum. Petals (6–7.5 in Sandy Hollow populations)–9–11 mm long, (3.5–)4–7 mm wide, enlarging slightly as fruit matures; adaxial surface with a sparse or rarely moderately dense simple indumentum; abaxial surface with a sparse stellate indumentum, the hairs concentrated on the midrib. Filaments pilose on the abaxial surface and the margins below the glandular tip; antesealous filaments c. 1.5 mm long, prominently glandular on the distal 0.5–1 mm; antepetalous filaments slightly tuberculate, c. 1 mm long; anther-apiculus minute to large, erect. Disc not or occasionally surrounding base of filaments slightly, glabrous or with occasional stellate hair. Style glabrous. *Cocci* c. 6 mm long, c. 3 mm wide, glabrous or with a moderately dense indumentum. Mature seed not seen.

*Selected specimens examined (of 15 collections):* NEW SOUTH WALES: NORTH WEST SLOPES: NW slope of Waa Mtn, above Waa Gorge, N section of Mt Kaputar NP [30°05'S 150°07'E], G.H. Harden, 1.x.1978 (NSW); NORTHERN TABLELANDS: Djarogens Warriors rock formation turn-off on the Dandahra Crag track, Gibraltar Ra. N.P., 29°32'54"S 152°18'26"E, M.F. Duretto 674–675, P.G. Neish and I. Thompson, 25.x.1995 (MEL, NSW); Murrumbidgee Cascade via Mulligans Hut, Gibraltar Range NP, 29°31'S 152°25'E, J.B. Williams, 8.x.1988 (NSW); CENTRAL WEST SLOPES: Goulbourn R. valley, 0.5 km S of Mt Kerrabee, 32°25'S 150°18'E, I.R. Telford 8187, 22.vi.1980 (CANB); Cox's Gap, 6.3 km W of Kerrabee, 32°27'S 150°16'E, R. Coveny 9593, 25.ix.1977 (CANB, NSW); Burrumbelong Ck [c. 32°24'S 150°02'E], M. Williams 86, 31.vii.1983 (NSW); Yarrawa via Denman, H. Mchern, x.1959 (NSW); Ranges near Bylong Ck, Goulburn R., 32°30'S 150°15'E, R.T. Baker, xi.1892 (NSW); Morrimbo, 50 miles N of Rylstone, R.T. Baker, x.1893 (NSW); Giants Ck, 2 miles NW of Sandy Hollow [32°14'S 150°31'E], R. Storey 6758, 6.x.1959 (CANB); Marobali NR, W of Wylong, T. Tame, ix.1981 (NSW); Mt Danger near Gungal, J.L. Boorman, 2.ix.1904 (NSW); E slope of Mt Danger near Gungal, A. Rodd 340, 27.viii.1966 (NSW); Owen's Gap, W of Scone, NSW, C. Burgess, 13.viii.1969 (DNA).

*Notes:* Typical specimens of *B. angustisepala* have narrow ovate-deltate sepals while populations north of Sandy Hollow have smaller flowers with sepals that are more ovate-deltate in outline as with *B. ledifolia*. Detailed field research is required in the Sandy Hollow area to determine the status of these populations and to see if these two species intergrade. A large-flowered form (referred to as *B. sp. D* (*aff. rubiginosa*) by Jacobs and Pickard 1981) from Mt Kaputar (NW slopes and tablelands) has petal as long as typical *B. angustisepala* (cf. Weston 1990) though they are wider. Some specimens of *B. angustisepala* from Cox's Gap have large hairs (up to 1 mm long) on the abaxial surface of the sepals and midribs of the petals: this variation also warrants further field research. *Boronia angustisepala* can be distinguished from *B. ledifolia* by having narrow ovate-deltate sepals and leaflets with obtuse tips, and from *B. amabilis* by larger leaflets and usually having a sparse indumentum on the abaxial surface of the petals, and from *B. umbellata* by the narrower leaflets.

*Distribution and ecology:* *Boronia angustisepala* occurs from the Gibraltar and Nandewar Ranges (Northern Tablelands) south to the Sandy Hollow-Bylong district



**Fig. 10.** Distribution of *Boronia alulata* species-group: *B. angustisepala* (□), *B. umbellata* (○), *B. mollis* (●), *B. amabilis* (★), *B. obovata* (■), *B. alulata* (▲), *B. quinkanensis* (△), *B. hoipolloi* (☆).

(Central Coast), New South Wales (Fig. 10). The species grows in dry sclerophyll forest on sandstone or granite. Flowering: June–November; fruiting: October–December.

**Conservation status:** A ROTAP code of 2RCa has been given to this taxon by Briggs and Leigh (1996), but 3RC- is more appropriate. Populations are conserved in Goulburn River N.P., Kanangra-Boyd N.P., Wollemi N.P. (Briggs and Leigh 1996), Gibraltar Range N.P., and possibly Mt Kaputar N.P.

**Etymology:** The specific epithet is derived from Latin *angustus* (narrow) and *sepala* (sepal) and refers to the narrowly ovate-deltate sepals of the species that distinguish it from *B. ledifolia* (see *Notes* and species 21 above).

- 24. *Boronia umbellata*** P. H. Weston, *Telopea* 4: 123 (1990). *Type:* New South Wales, North Coast; Sherwood Ck, 28 km NW of Coffs Harbour, 30°03'S 153°03'E, *H. Steimann* 8124, 11.x.1978 (holotype CANB [CBG7809599]; isotypes K *n.v.*, MEL 1606335, NSW (2 sheets), PERTH 1623435).

*Boronia* sp. E (aff. *mollis*) *sensu* Jacobs and Pickard (1981, p. 191).

**Illustration:** P.H. Weston and M.F. Porteners, *Fl. New South Wales* 2: 232 (1991).

Erect, much branched *shrub* to 2 m tall. Multiangular stellate hairs with c. 5–20 rays; rays white to red-brown, 0.1–0.5 mm long. Branches with a dense, stellate indumentum,

becoming glabrous as they age. *Leaves* 20–95 mm long, 10–55 mm wide in outline, with (1–)3–7 leaflets, the leaflet number per leaf increasing along branches; petiole 6–20 mm long, winged; rachis segments 8–20 mm long, 1–2 mm wide; leaflets elliptic to broadly elliptic, sessile, obtuse, plane, adaxial surface glabrous or with few stellate hairs on the midrib; terminal leaflet 21–43 mm long, 10–15 mm wide, longer than lateral leaflets; lateral leaflets 15–33 mm long, 8–15 mm wide. *Inflorescence* 1–10-flowered, with a moderately dense to dense stellate indumentum; peduncle 4–12 mm long; prophylls minutely unifoliolate, or minutely imparipinnate, 1–5 mm long, 0.5–1 mm wide; metaxyphylls minute; anthopodium 4–15 mm long. Sepals ovate-deltate, acuminate, 2.5–3 mm long, 1.5–2 mm wide, not enlarging significantly as fruit matures; abaxial surface with a moderately dense stellate indumentum. Petals 7–10 mm long, 3.5–4 mm wide, enlarging slightly as fruit matures; adaxial surface sparsely simple pubescent and sometimes becoming glabrous towards base; abaxial surface with a sparse to moderately dense stellate indumentum. Filaments pilose on the abaxial surface and the margins below the glandular tip; antesealous filaments 1–1.5 mm long, prominently glandular on the distal 0.5 mm; antepetalous filaments c. 1 mm long; anther-apiculum minute. Disc swollen, surrounding base of filaments slightly, with an occasional stellate hair. Style glabrous. *Cocci* glabrous. Mature fruit and whole seed not seen.

*Additional specimens examined:* NEW SOUTH WALES: NORTH COAST: Intersection of Whinge Rd and Perberry's Spur Rd, above Sherwood Ck, 30°05'S 153°03'E, *G.J. Harden* 93031 and *D.W. Harden*, 6.ix.1993 (MEL, NSW); Clarence R., *Wilcott*, xi.1875 (MEL); Richmond River, *Mrs Hodgkinson*, xii.1884 (MEL); Waihou Trig., 30° 05' S 153° 02' E, *C. Burgess*, 25.viii.1973 (NSW, PERTH); Sherwood forest reserve, Orara Valley, 30°00'S 153°00'E, *A. Specht*, x.1990 (NSW); Wedding Bells SF, Coffs Harbour district, 30°06'S 153°10'E, *K. Gray*, 8.ix.1953 (NSW); Caledonian Knob Rd, Bagawa SF, 12 km S of Glenreagh, 30°08'S 152°58'E, *A.R. Bean* 2438, (BRI, NSW); 15 km from Moonie Ck, turn off to Cower Bucca, 30°09'E 153°08'E *R.N. Steley*, xii.1974 (NSW); Nana Glen, *D.W.G. Shiress*, vii.1924 (NSW); Coramba Mt, Orara R., *J.L. Boorman*, xi.1912 (NSW); Coffs harbour to Grafton, *J.H. Maiden* and *J.L. Boorman*, xi.1903 (NSW).

*Notes:* Maiden and Baker (1895) and Maiden and Betehe (1905) included *B. umbellata* in *B. mollis*, and Cheel (1928) included it in what he called *B. rubiginosa* (= *B. angustisepala*, see above) (see Weston 1990). *Boronia umbellata* can be distinguished from *B. mollis* by having a dense indumentum on the abaxial surface of the leaves, from *B. angustisepala* by its larger leaflets, and from all species in the *B. alulata* species-group by its ovate-deltate sepals.

*Distribution and ecology:* *Boronia umbellata* occurs between Athol Glen and Coramba, north of Coffs Harbour, New South Wales (Fig. 10), where it is found in wet sclerophyll forest on sandstones and meta sediments (Weston 1990). Flowering: June–November; fruiting: October–December.

*Conservation status:* 2VC- (Briggs and Leigh 1996).

- 25. *Boronia mollis*** A. Cunn. ex Lindl., *Edwards's Bot. Reg.* 27 (1841). *Type Citation:* "Nepean River, New Holland, 1825." *Type:* Nepean River, N.S. Wales [Central Coast, New South Wales, c. 34°S 150°40'E], A. C. [A. Cunningham], 1825 (lectotype, here designated, CGE *n.v.* (transparency MEL 2041247, NSW); isoelectotypes BRI AQ318454, K (ex Linnean Society) *n.v.* (cibachrome MEL 2041214, cibachrome NSW), K (Allan Cunningham's Australian Collection) *n.v.* (cibachrome MEL 2041218, photograph AD 99803346, left hand specimen)).

*Illustrations:* A.M. Blomberry, *What Wildflower Is That?*, 68 (1973); J. Galbraith, *Field Guide to the Wild Flowers of South-East Australia*, t. 17.3 (1977); W.R. Elliot



and D.L. Jones, *Encyclopedia of Australian Plants* 2nd ed., 345 (1985); I. Clarke and H. Lee, *Name That Flower*, 121, fig. 62 (1987); L. Cronin, *Consise Austral. Fl.*, 79 (1989); A. Fairley and P. Moore, *Native Plants of the Sydney District*, 234, t. 808 (1989); L. Robinson, *Field Guide to the Native Plants of Sydney*, 115 (1991); P.H. Weston and M.F. Porteners, *Fl. New South Wales* 2: 232 (1991).

Erect, much branched *shrub* to 2 m tall. Multiangular stellate hairs with c. 7–20 rays; rays white to red-brown, 0.1–1.25 mm long. Branches with a moderately dense to dense stellate indumentum, becoming glabrous as they age. *Leaves* 10–60 mm long, 6–30 mm wide, not obviously glandular to slightly glandular, with (1–)3–9 leaflets, the leaflet number per leaf increasing along branches; petiole 2–28 mm long, winged; rachis segments ([*Errington* 545 ] 2.5–)5–7 mm long, 1–2 mm wide, winged, elliptical; leaflets sessile to subsessile, petiolule to 2 mm long, lamina broadly elliptic, obtuse, plane; adaxial surface glabrous or with a sparse stellate indumentum; abaxial surface with a sparse to moderately dense indumentum of multiangular stellate hairs, peltate stellate hairs absent; terminal leaflet 6–35 mm long, 4–9 mm wide, longer than lateral leaflets; lateral leaflets 5–11 mm long, 3–6 mm wide. *Inflorescence* 3-flowered, with a moderately dense stellate indumentum; peduncle 2–3 mm long; prophylls 0.5–1 mm long, 0.5–1 mm wide; metaxephylls minute to 0.5 mm long; anthopodium 6–12 mm long. Sepals 3–5 mm long, c. 1 mm wide, enlarging slightly as fruit matures. Petals (4.5–)7–10 mm long, (2.5–)3–4.5 mm wide, enlarging slightly as fruit matures; adaxial surface sparsely simple pubescent; abaxial surface with a moderately dense stellate indumentum. Filaments glabrous or rarely pilose below glandular tip; antesealous filaments 1–1.5 mm long, prominently glandular on the distal 0.5 mm; antepetalous filaments slightly tuberculate, 0.5–1 mm long; anther-apiculum absent. Disc glabrous, enlarged and swollen, surrounding base of filaments. Style glabrous. *Cocci* (not seen) glabrous (*fide* Weston and Porteners, 1991). Seed not seen. *Soft Boronia*.

*Selected specimens examined* (of c. 30 collections): NEW SOUTH WALES; CENTRAL COAST: Manning R. National Forest No. 1, between “Big Nellie” and “Little Nellie”, C. and I.P. Burgess, 28.iii.1962 (MEL); Landsdow SF, Newbys Creek Rd., 31°44’S 152°32’E, P. Gilmour 5872, 23.ix.1986 (CANB); Comboyne State Forest 698, 15 miles SW of Kendall, E.F. Constable, 27.x.1956 (NSW); Coal and Candle Cks, E.F. Constable, 21.ix.1949 (NSW); Between Kendall and Taree, Pacific Hwy, R.G. Coveny, 9.ix.1967 (NSW); Palm Beach, Walters, x.1934 (NSW); Foley Hill, Bayview, E. Hoskin, 16.ix.1951 (NSW); Erskine Ck, Jack Even Track, Blue Mountains NP, 33°51’S 150°35’E, P.H. Weston 1056, 13.ix.1987 (NSW); Erskine Ck. Blue Mountains, mouth of Big Crater Ck, T.S. Whaite 240, 29.vii.1959 (NSW); Norton’s Basin 3 km WNW of Wallacia, 33°52’S 150°36’E R. Convey 11178, 17.vii.1982 (NSW); Deep Ck Narrabeen, O. Hellzer, iii.1967 (NSW); In gully S of 95 Cabbage Tree Rd, Bayview, 33°40’S 151°18’E, R. Johnson 132 and C. Coulton, 15.xi.1988 (NSW); Church Pt, Cowan, R. Tate, xi.1927 (NSW); CENTRAL TABLELANDS: Wollemi N.P., G. Errington 545, 28.vi.1996 (NSW).

*Typification*: Lindley (*loc. cit.*) stated that the authority of *B. mollis* was A. Cunningham and referred to a 1825 Nepean River collection. It can be assumed that the collection was an Allan Cunningham collection. Specimens matching this information have been located at BRI, CGE and K. Annotations on one of the K sheets states it was a gift from LINN, while the other sheet was part of Alan Cunningham’s herbarium. The CGE sheet label reads ‘Nepean River N.S. Wales 1825 AC’: the AC is no doubt referring to the collector being Alan Cunningham. This sheet is in excellent condition and is chosen as the lectotype.

*Notes*: A collection from the northern end of Wollomi N.P. (*Errington* 545, NSW) have smaller leaves, in general, than other plants. Also, the abaxial surface of the sepals and the midrib on the abaxial surface of the petals have an indumentum of large, purple,

stellate hairs. Here the plant is assigned to *B. mollis* and further collections, with fully developed flowers, are needed to determine if this variant warrants taxonomic recognition.

Bentham (1863) considered *B. mollis* and *B. fraseri* to be similar in the morphology of both the style and stamen, and both do have short filaments surrounded at the base by the disc (as does *B. umbellata* and sometimes *B. angustisepala* and *B. keysii*). This relationship was also suggested by Mueller (1875, p. 111) and Maiden and Betche (1905). Maiden and Betche (1905) considered *B. mollis* and *B. fraseri* to be part of a cline including *B. ledifolia*. *Boronia mollis* can be distinguished from *B. fraseri* by its moderately dense indumentum with large hairs (to 1 mm long); and from *B. ledifolia*, *B. angustisepala* and *B. umbellata* by the absence of a dense indumentum of small peltate hairs on the abaxial surface of the leaves. A chromosome number of  $n=16$  was recorded by Smith-White (1954). Thin-walled vesiculose sclereids have been reported for this species (Rao and Bhattacharya 1978, 1981).

**Distribution and ecology:** *Boronia mollis* occurs from the Kendall District to Sydney, New South Wales (Fig. 10), where it is found growing in dry sclerophyll forests in gullies on sandstone (Weston and Porteners 1991). Flowering: June–November; fruiting: October–December.

**Conservation status:** 2R.

**26. *Boronia amabilis*** S. T. Blake, *Proc. Roy. Soc. Queensland* 73: 74 (1963). Type: Lyra, Qd, S.T. Blake 21094, 3.x.1959 (holotype BRI AQ035209; isotypes BRI AQ318430, BRI AQ318431, CANB 378177, MO n.v., NSW).

**Illustration:** J. Galbraith, *Field Guide to the Wild Flowers of South-East Australia*, t. 17.1 (1977); B. McDonald, C. Gravatt, P. Grimshaw and J. Williams, *The Flora of Girraween and Bald Rock National Parks*, 65 (1995).

Erect, much branched *shrub* to 2 m tall. Multiangular stellate hairs with c. 10–25 rays; rays white to red-brown, 0.1–1 mm long. Branches with a dense, stellate indumentum, becoming glabrous as they age. *Leaves* 10–55 mm long, 6–28 mm wide in outline, with 3–15 leaflets, the leaflet number per leaf increasing along branches; petiole 3–5 mm long, winged; rachis segments 2–7 mm long, 1–2 mm wide, winged, elliptical; leaflets sessile, elliptic, obtuse, the margins recurved (rarely plane), adaxial surface with a sparse to moderately dense stellate indumentum; terminal leaflet 3–18 mm long, 1.5–6 mm wide, longer than laterals; lateral leaflets 3–15 mm long, 2–4 mm wide. *Inflorescence* (1–)3–7-flowered, with a moderately dense to dense stellate indumentum; peduncle 2–5 mm long; prophylls minutely unifoliolate or minutely imparipinnate, 1–2 mm long, 0.5–1 mm wide; metaxephylls minute; anthopodium 3–6(–10) mm long. Sepals narrowly ovate-deltate, 3.5–6 mm long, 1–2.5 mm wide, enlarging slightly as fruit matures; abaxial surface with a moderately dense to dense stellate indumentum. Petals 8–12 mm long, 4–6 mm wide, enlarging to 15 mm long and 8 mm wide as fruit matures; adaxial surface with a sparse simple or stellate minute indumentum, sometimes becoming glabrous towards base; abaxial surface with a moderately dense to dense stellate indumentum. Filaments pilose on the abaxial surface and the margins below the glandular tip; antesepalous filaments c. 2 mm long, prominently glandular on the distal 0.5–1 mm; antepetalous filaments c. 1.5 mm long; anther-apiculum minute or large, erect or reflexed. Disc glabrous, entirely within stamen whorl. Style glabrous. *Cocci* 4–5 mm long, 2–3 mm wide, glabrous. Seed 3–4.5 mm long, 1.5–2.5 mm wide. *Wyberba Boronia*.

**Selected specimens examined** (of c. 20 collections): QUEENSLAND; DARLING DOWNS DISTRICT: Signboard Mtn, Girraween N.P., 28°49'50"S 151°58'49"E, *P.I. Forster* 17580 and *S.J.*

Figg, 26.viii.1995 (BRI *n.v.*, MEL); Junction track, c. 300 m after crossing Bald Rock Ck from Bald Rock Ck camping area, Girraween NP, c. 28°55'S 151°56'E *M.F. Duretto* 353-354 and *M. Bayly*, 15.ix.1993 (MFD353: BRI, MEL, NSW; MFD354: MEL); Mt Norman, 7 km NW of Wallangarra, 28°52'S 151°58'E *I.R. Telford* 3115, 25.ix.1973 (NSW, CANB); Castle Rock-Mt Norman saddle, 6 km NNE of Wallangarra, 28°53'S 151°57'E, *I.R. Telford* 9848 and *M. Crisp*, 28.ix.1984 (AD, CANB, MEL); 2 miles E of Ballandean, property of B. McDonagh, 28°49'S 151°53'E *W.E. Fischer* 198, 17.x.1974 (BRI, CANB, NSW); Wyberba, Bald Rock Ck, 6 miles S of Stanthorpe, *L. Pedley* 1561, 31.x.1963 (BRI); On property of W. McDonagh, Lyra, *K.N. Shea* S123, 22.x.1962 (BRI).

*Notes:* *Boronia amabilis* can be distinguished from *B. granitica* and *B. repanda* by having a dense indumentum of sessile hairs on the abaxial surface of the leaves; from *B. ledifolia* by its narrowly deltate sepals; and from *B. angustisepala* by its moderately dense to dense indumentum on the abaxial surface of the petals. Unbranched sclereids have been reported for this species (Rao and Bhattacharya 1981).

*Distribution and ecology:* *Boronia amabilis* occurs over a limited area around Wyberba and Girraween N.P., Queensland (Fig. 10), where found growing in open eucalypt forest or woodland over granite. Flowering: August–November; fruiting: October–November.

*Conservation status:* 2RC- (Briggs and Leigh 1996): found in Girraween N.P.

**27. *Boronia obovata*** C. T. White, *Proc. Roy. Soc. Queensland* 53: 206 (1942). *Type:* Leichhardt District, Blackdown Tablelands, *H.G. Simmons* No. 3, Sept., 1937 (holotype BRI AQ11381 & AQ11380 (transparency MEL 2041231)).

*Illustrations:* K.A.W. Williams, *Native Plants Queensland* 2: 58 (1984) ; S. Pearson and A. Pearson, *Plants of Central Queensland*, 73 (1988); J.W. Wrigley and M. Fagg, *Australian Native Plants*, 222 (1988).

Erect, much branched *shrub* to 2 m tall. Multiangular stellate hairs with c. 6–20 rays; rays white to yellow, 0.1–1 mm long, becoming weak and flexuous as the hair ages. Branches with a sparse to dense, stellate indumentum. *Leaves* trifoliolate but first few pairs on seedlings and axillary branches simple; petiole 1–5 mm long, not winged; leaflets sessile or on petiolule to 5 mm long, lamina elliptic to oblanceolate, acute to obtuse, the margins revolute to recurved, adaxial surface with a sparse to moderately dense stellate indumentum; terminal leaflet 6–42 mm long, 1.5–11 mm wide, longer than laterals; lateral leaflets 4–23 mm long, 1.5–8 mm wide. *Inflorescence* 1–3-flowered, with a dense, stellate indumentum; peduncle 0.5–4 mm long; prophylls minutely unifoliolate, 1–3 mm long, 0.5–2 mm wide; metaxyphylls minute to 0.5 mm long; anthopodium 2–9 mm long. Sepals 3–5.5 mm long, (0.5–)1–1.5 mm wide, not enlarging significantly as fruit matures; abaxial surface with a moderately dense to dense stellate indumentum. Petals 4.5–8 mm long, 2.5–4 mm wide, enlarging slightly as fruit matures; adaxial surface sparsely simple or stellate minutely pubescent, becoming glabrous towards base; abaxial surface with a moderately dense to dense stellate indumentum. Filaments pilose on the abaxial surface and the margins below the glandular tip; antesealous filaments 1.5–2.5 mm long, prominently glandular on the distal 0.5–1 mm; antepetalous filaments tuberculate, 1–1.5 mm long; anther-apiculum large, reflexed. Disc glabrous, entirely within stamen whorl. Style glabrous. *Cocci* 4.5–6 mm long, 2–3 mm wide, glabrous or with a sparse to moderately dense, simple and/or stellate indumentum. Seed 4–5 mm long, 2–2.5 mm wide.

*Selected specimens examined* (of c. 30 collections): QUEENSLAND; PORT CURTIS DISTRICT; On track between Rainbow Falls and the car park, Blackdown Tablelands NP, 23°50'30"S 149°06'00"E, *M.F. Duretto* 293-302 and *M. Bayly*, 9.ix.1992 (MFD293, 295, 299-301: BRI, MEL; MFD294, 296-298: MEL; MFD302: BRI, CANB, MEL, NSW, PERTH); On track



south from Peregrine lookout, Blackdown Tablelands NP, 23°50'S 149°06'E, *M.F. Duretto* 303-306, 308-312 and *M. Bayly*, 9.ix.1992 (*MFD303-306*: MEL; *MFD308, 311*: BRI, MEL; *MFD309*: BRI, MEL, NSW; *MFD310, 312*: BRI, CANB, MEL, NSW); Horseshoe Lookout, Blackdown Tableland, c. 7 km SE of Blackwater, 23°45'S 149°07'E, *P.C. Jobson* 278, 18.v.1988 (MEL); Blackdown Tablelands, c. 6 km westerly from forestry camp on Mimosa Ck, 23°47'S 149°07'E, *K.A. Williams* 74061, 3.ix.1974 (BRI); Blackdown Tablelands, 12 miles SSE of Bluff, *R.W. Johnson* 1011, 20.ix.1959 (BRI); Rockland Spring, 26 miles SSE of Blackdown Township, Leichhardt District, *Storey and Yapp* 237, 15.ix.1962 (AD, CANB, DNA, PERTH); Blackdown Tablelands, South Mimosa, Old Creek Rd towards gorge, 23°48'S 149°08'E, *J. Armstrong* 1111 and *J.M. Powell*, 21.ix.1977 (CANB); c. 32 km SE of Blackwater, (Campsite on Mimosa Ck), 23°5-'S 149°0-'E, *R.J. Henderson* 611, *S.B. Andrews* and *P. Sharpe*, 18.iv.1971 (BRI, CANB, MEL, NSW); Westbrook Station, *C.H. Gittens* 251, vii.1959 (BRI).

*Notes*: White (1942) thought *B. obovata* had affinities with *B. triphylla* (= *B. ledifolia*), which is true in a broad sense although *B. obovata* is more closely related to the species in the *B. alulata* species-group (Duretto and Ladiges 1999). *Boronia obovata* can be distinguished from these species by always having trifoliate leaves. The local Aboriginals apparently collected and ate the pollen of this species (Pearson and Pearson 1989).

*Distribution and ecology*: *Boronia obovata* is endemic to the Blackdown Tablelands, Central Queensland (Fig. 10), where it is found in eucalypt woodland and forest on sandstone. Records of this species from the Maranoa District (Ross 1994; Forster 1997) are most likely records of *B. duiganiae*. Flowering: January-September; fruiting: April-October.

*Conservation status*: Though restricted in distribution, *B. obovata* is common in the Blackdown Tablelands N.P. and State Forests and so seems secure.

28. *Boronia alulata* Sol. ex Benth., *Fl. austral.* 1: 313 (1863). *Type citation*: "Queensland, Endeavour River, *Banks* and *Solander*, R. Brown. (hb Brit. Mus. and R.Br.)" *Type*: Endeavour River [15°27'S 145°15'E, Cook, Qld], *Banks* and *Solander*, 1770 (herbarium of R. Brown) (lectotype, here designated, BM (sheet with two branchlets and a type label in the upper right corner) *n.v.* (transparencies BRI, MEL 2041232); isolectotypes BM (sheet with five branchlets and a type label in the lower right corner) *n.v.* (transparency MEL 2041233), K *n.v.* (cibachrome MEL 2041206; photograph AD 99548189), MEL 2041249).

*Illustrations*: W.R. Elliot and D.L. Jones, *Encyclopedia of Australian Plants* 2nd ed., 345 (1985); H. Ebes *The Florilegium of Captain Cook's First Voyage to Australia, 1768-1771*, 56, t. 28 (1988).

Erect, much branched *shrub* to 3 m tall. Multiangular stellate hairs with c. 5–10 rays; rays white to yellow, 0.1–0.5 mm long. Branches with a dense, stellate indumentum, becoming glabrous as they age. *Leaves* 8–40 mm long, 7–25 mm wide in outline, with 5–17 leaflets, the leaflet number per leaf increasing along branches; petiole 1–5 mm long, winged; rachis segments 1.5–5 mm long, 0.5–1.5 mm wide, winged, elliptical; leaflets sessile to subsessile, narrowly elliptic to elliptic, acute, the margins revolute to recurved, adaxial surface glabrous to glabrescent with hairs mainly on the midrib; terminal leaflet 3–13 mm long, 1–4 mm wide, c. equal to lateral leaflets; lateral leaflets 3–9 mm long, 1–4 mm wide. *Inflorescence* 3–7-flowered, glabrous or with a sparse to dense, stellate indumentum; peduncle 1–30 mm long; prophylls minutely unifoliate or minutely imparipinnate, 1–7 mm long, to 0.5 mm wide; metaxyphylls minute to 0.5 mm long; anthopodium 1–6 mm long. Sepals narrowly deltate, acute, 2–5 mm long, 1–1.5 mm



wide, not enlarging significantly as fruit matures; abaxial surface glabrous to glabrescent, or, with a moderately dense to dense stellate indumentum. Petals (3–)5–7 mm long, (1.5–)2.5–3.5 mm wide, enlarging to 6–9 mm long and 2.5–4 mm wide as fruit matures; adaxial surface densely and minutely pubescent, becoming glabrous towards base; abaxial surface glabrous to glabrescent, or, with a moderately dense to dense stellate indumentum. Filaments pilose on the abaxial surface and the margins below the glandular tip; antepetalous filaments 2–2.5 mm long, prominently glandular on the distal 0.5 mm; antepetalous filaments slightly tuberculate, 1.5–2 mm long; anthers attached subapically to the filament, anther-apiculum absent or rarely minute. Disc glabrous, entirely within stamen whorl. Style glabrous. *Cocci* 3–5 mm long, 1.5–2.5 mm wide, glabrous, glossy. Seeds 2–4.5 mm long, 1.5–2 mm wide. *Bala-bal-balg* (Bailey 1913).

*Selected specimens examined (of c. 60 collections):* QUEENSLAND; COOK DISTRICT: Dackany Ck, feeding into the N side of Oxford Ness, 11°18'S 142°49'E, *D. Fell* 893465, 16.vii.1987 (BRI); Cape York Peninsular, in the vicinity of McDonnell, 11°35'S 142°27'E, *R. Isabell*, vii.1970 (BRI); 18.4 km by road SE of Heathlands, 11°47'S 142°40'E, *J.R. Clarkson* 9234 and *V.J. Neldner*, 28.ii.1992 (BRI, MBA, MEL); Bertie Ck crossing, c. 13 km SW of Heathlands, 11°50'S 142°30'E, *P.C. Jobson* 793 and *G.C.J. Power*, 2.ix.1989 (MEL); Olive R., 12°10'S 143°05'E, *B. Hyland* 7462, 13.ix.1974 (MEL, QRS); 9 km along Bolthead Rd, off Maloney's Springs Rd, 12°24'S 142°29'E, *P. Forster* 5493, 25.vi.1989 (BRI, CANB); 17 km NE of Browns Ck towards Iron Ra. (191 km c. N of Coen by road), c. 12°43'S 143°13'E, *R. Coveny* 7133 and *P. Hind*, 15.ix.1975 (BRI, CANB, NSW); Mt Tozer, 12°43'S 143°12'E, *J. Clarkson* 2886, 22.ii.1980 (BRI, DNA, MBA, QRS); Bathurst Bay (Muck R.), 14°20'S 144°25'E, *B. Hyland* 6311, 27.vii.1972 (BRI, QRS); 14.5 km N of Wakooka on the track to Bathurst Bay and Cape Melville NP, 14°25'S 144°30'E, *J.R. Clarkson* 5369, 16.vi.1984 (BRI, CANB, DNA, MBA); road between Heathlands and Captain Billy Heath, 11°44'S 142°37'E, *A. Moreton* 584, 13.v.1980 (BRI); Starke Station Homestead-Cape Flattery, 15°02'S 145°10'E, *L. Webb* and *J. Tracey* 13800, 13.vii.1976 (BRI, QRS); 3.5 km N of the mouth of the Mclvor R., 15°06'S 145°15'E, *J. Clarkson* 5222, 3.ii.1984 (BRI, CANB, DNA, MBA, QRS); Beach dunes S of Cape Bedford, c. 23 km NNE of Cooktown, 15°17'S 145°21'E, *J. Clarkson* 3302, 30.vii.1980 (CANB, DNA, BRI, MBA, QRS, NSW); Along track, 19 km E of Hopevale Mission near Quoin Hill, c. 15°19'S 145°15'E, *A. Kanis* 1920, 4.viii.1978 (CANB); 6 km from Cooktown-Mareeba Rd along road to Archer Point, 15°35.77'S 145°17.53'E, *M.F. Duretto* 394-395 and *A. Vadala*, 23.v.1993 (BRI, CANB, MEL, NSW, PERTH).

*Typification:* When Bentham (1863) described *B. alulata* he stated he had seen specimens from Endeavour River collected by Banks and Solander and R. Brown: viz. "Qld. Endeavour river, *Banks* and *Solander*, *R. Brown* (Hb. Brit. Mus. and R.Br.)". Specimens collected by Banks and Solander have been located at BM, K and MEL. There are two sheets at BM: one with five twigs, and the other with two, and as the latter is in the better condition it is designated the lectotype. This sheet has a type label in the upper right hand corner, and the other BM sheet has a type label in the lower right hand corner.

*Notes:* This species is variable in the size of the leaf, inflorescence and floral parts. Specimens from the top of Mt Tozer and other exposed areas tend to be smaller than those from more sheltered positions. These differences appear to be environmental but the variation does warrant further field research. The abaxial surface of the petals can be glabrous to glabrescent, or densely hirsute depending on the specimen. These forms are sympatric and some collections (i.e. *Moreton* 584) include both. This variation is not considered to be of any significant taxonomic importance, but would make an interesting study.

*Boronia alulata* is closely related to *B. quinkanensis* and *B. hoipolloi* (Duretto and Ladiges 1999) from which it can be distinguished by being glabrous or having a sparse indumentum on the adaxial surface of the leaves. It can be distinguished from *B. ledifolia*,

a species with which it is sometimes confused, by the anthers being attached sub-apically to the filaments and the long, narrow sepals. The Aboriginal people of the Endeavour River call this species "Bala-bal-balgai" (Bailey 1913).

*Distribution and ecology:* *Boronia alulata* occurs from the tip of Cape York to just south of Cooktown, Queensland (Fig. 10), and is found in woodlands and heaths on sand and silts in coastal and upland areas. Flowering: February–November; fruiting: May–November.

*Conservation status:* Common, widespread, found in several conservation reserves and under no immediate threat.

**29. *Boronia quinkanensis*** Duretto, *Austrobaileya* 5: 291 (1999), fig. 14 F–K. *Type:* 22.4 km from Kennedy River on the Jedda Creek Track to King River Station, 15°41'S 143°47'E, J.R. Clarkson 3712, 24.vi.1981 (holotype BRI AQ348406; isotypes CANB 372104, CANB (CBG 8505343), DNA *n.v.*, K *n.v.*, MO *n.v.*, NSW 244358).

*Boronia* sp. "Jedda Creek" (J.R. Clarkson 3712) *sensu* Thomas and McDonald (1987, p. 49; 1989, p. 46).

*Boronia* sp. "Mt Mulligan" (J.R. Clarkson 5769) *sensu* Thomas and McDonald (1987, p. 49; 1989, p. 46).

*Boronia* sp. (Mt Mulligan, J.R. Clarkson 5301) *sensu* Ross (1994, p. 303); Forster (1997, p. 185).

*Boronia* sp.4 (Mt Mulligan; J.R. Clarkson 5301) *sensu* Briggs and Leigh (1996, p. 167).

Erect, much branched *shrub* to 2.5 m tall, with a dense, stellate indumentum on the branches, leaves and inflorescence parts. Multiangular stellate hairs with 7–15 rays; rays white, 0.1–0.5 mm long, firm, straight, glossy, smooth. *Leaves* 6–25 mm long, 4–15 mm wide in outline, with (1–)3–11 leaflets, the leaflet number per leaf increasing along branches; petiole 1–5 mm long, winged; rachis segments 1.5–6 mm long, 0.5–2 mm wide, winged, broader at the distal end; leaflets elliptic to oblanceolate, subsessile, obtuse, the margins recurved; terminal leaflet (2–)6–15 mm long, (1–)3–7 mm wide, longer than preceding laterals but otherwise shortest; lateral leaflets (2–)5–11 mm long, (1–)3–5 mm wide. *Inflorescence* 1–3(–5–9)-flowered; peduncle 1–23 mm long; prophylls minutely unifoliolate or minutely imparipinnate, 2.5–5 mm long, 1.5–3 mm wide; metaxyphylls minute to 0.5 mm long; anthopodium 1–10 mm long. Sepals narrower but c. the same length or slightly shorter than petals, acute to slightly acuminate, 3–5 mm long, 1–1.5 mm wide, not enlarging significantly as fruit matures; abaxial surface with a moderately dense to dense stellate indumentum. Petals 4–5.5 mm long, 2–3 mm wide, enlarging to 6–7 mm long as fruit matures; adaxial surface with a sparse simple indumentum, becoming glabrous towards base; abaxial surface with a dense, stellate indumentum. Filaments pilose on the abaxial surface and the margins below the glandular tip; antesepalous filaments 1.5–2 mm long, prominently glandular on the distal 0.5 mm; antepetalous filaments slightly to strongly tuberculate, 1–1.5 mm long; anthers attached subapically to the filament, anther-apiculum present but minute. Disc glabrous, entirely within stamen whorl. Style glabrous. *Cocci* 3.5–4.5 mm long, 2–2.5 mm wide, glabrous or glabrescent, glossy. Seeds 3–4 mm long, 1.5–2 mm wide.

*Selected specimens examined (of 15 collections):* QUEENSLAND; COOK DISTRICT: Sandy Ck area N of Jowalbinna, 15°43'S 144°18'E, A.R. Bean 1710, 4.vii.1990 (BRI, NSW); Near Laura R., 15°45'S 144°39'E, N. Byrnes 3079, 26.viii.1974 (BRI, MEL, NSW); Jowalbinna camp, c. 30

km SSW of Laura, 15°45'S 144°15'E, *H. van der Werff* 11716, 15.vi.1990 (QRS); 35 km directly SW of Laura, just below escarpment of Pine Tree Ck, 15°47'S 144°12'E, *M. Parris* 9198, 21.iv.1987 (BRI, CANB); 35 km SW of Laura, on plateau leading to escarpment above Brady Ck, 15°47'S 144°13'E, *M. Parris* 9200, 23.v.1987 (BRI, CANB, NSW); 4 km S of the crossing of Shepherd Ck on the Maytown Track, 15°47'S 144°16'E, *J.R. Clarkson* 9619 and *V.J. Neldner*, 17.vi.1992 (BRI, DNA, K, L, M, MBA, MEL, NSW, PERTH, QRS); 6 km south of Jowalbinna turn off on the Maytown track, 15°48'S 144°16'E, *J.R. Clarkson* 5050, 17.xi.1983 (CANB); c. 42 km directly SSW of Laura, and c. 2 km W of Maytown track just above escarpment of Mossman Ck, 15°55'S 144°18'E, *M. Parris* 9190, 19.v.1987 (CANB); Mount Mulligan, c. 30 km NW of Dimbulah, 16°48'S 144°49'E, *J.R. Clarkson* 10541, 28.vi.1995 (BRI, MBA, MEL); Foot of cliffs, Mt Mulligan, 16°52'S 144°52'E, *H. Flecker*, 18.xii.1936 (QRS); The Gorge, Mt Mulligan, *Dr. Flecker*, 2.iv.1934 (BRI); Mt Mulligan, c. 40 km NW of Dimbulah, 16°52'S 144°51'E, *J. R. Clarkson* 5769, 15.iv.1985 (BRI, CANB, DNA, MBA, MEL, QRS); SW part of Mt Mulligan, c. 16°54'S 144°51'E, *M.F. Duretto* 380, 385, 388-389 and *A. Vadala*, 20.v.1993 (MFD380: MEL; MFD385: BRI, CANB, DNA, K, MEL, NSW, PERTH; MFD388: AD, BRI, MEL; MFD389: AD, BRI, CANB, DNA, MEL, NSW).

*Notes:* *Boronia quinkanensis* can be distinguished from *B. hoipolloi* by its wider leaflets (> 1 mm wide); from *B. lanuginosa* by having sepals that are never wider than the petals and rarely longer; and from all other species of *Boronia* in north Queensland by the dense indumentum on the leaves and stems.

*Distribution and ecology:* *Boronia quinkanensis* occurs in the 'Quinkan' sandstone country south of Laura, and also on Mt Mulligan (near Dimbulah) to the south, Queensland (Fig. 10), where it is found in woodland and heath on sandstone. Flowering and fruiting: April-December.

*Conservation status:* 3R (Duretto 1999).

30. *Boronia hoipolloi* Duretto, *Austrobaileya* 5: 288 (1999), fig. 14 A-E. *Type:* Amphitheatre, a sandstone escarpment c. 27 km north of Musslebrook mining Camp, 18°21'S 138°09'S, *J.R. Clarkson* 10473, 12.vi.1995 (holotype BRI; isotypes MEL 2032037, MEL 2032038).

*Boronia* aff. *alulata* (NW Qld, *Clarkson* 10473) *sensu* Duretto (1997, pp. 302, 315).

Pendulous or erect, much branched *shrub* to 50 cm long, with a dense, stellate indumentum on the branches, leaves and inflorescence parts. Multiangular stellate hairs sessile, 4-12 rays; rays white, to 0.2 mm long, firm, straight, glossy, smooth. *Leaves* 15-35 mm long, 5-13 mm wide in outline, with 7-25 leaflets, the leaflet number per leaf increasing along branches; petiole 2-5 mm long, winged; rachis segments 1.5-6 mm long, c. 0.5 mm wide, winged, oval; leaflets opposite or sometimes subopposite, subsessile, narrowly-elliptic to linear, obtuse, the margins recurved; terminal leaflet 1-8 mm long, 0.5-1 mm wide; lateral leaflets 1-7 mm long, 0.5-1 mm wide, longer than most distal lateral leaflets but shorter than others. *Inflorescence* 1-5-flowered; peduncle to 2 mm long; prophylls minutely unifoliate or minutely imparipinnate, to 2.5 mm long; metaxyphylls minute; anthopodium 1-4 mm long. Sepals acute to slightly acuminate, 2-3.5 mm long, 0.75-1.25 mm wide, not enlarging significantly as fruit matures; abaxial surface with a moderately dense to dense stellate indumentum. Petals 3.5-5 mm long, 1.5-2 mm wide, not enlarging significantly as fruit matures; adaxial surface with a moderately dense simple indumentum, becoming glabrous towards base; abaxial surface with a dense, stellate indumentum. Filaments pilose on the abaxial surface and the margins below the glandular tip; antesealous filaments c. 2 mm long, prominently glandular on the distal 0.5 mm; antepetalous filaments slightly tuberculate or not, 1-1.5

mm long; anthers attached subapically to the filament, abaxial surface not frosty, appendage absent or minute. Disc glabrous, entirely within stamen whorl. Style hirsute or glabrous. *Cocci* (fully mature cocci not seen) c. 3.5 mm long, c. 2 mm wide, glabrous or glabrescent. Seeds (mature seeds not seen) grey, dull, 1.5–2 mm long, 1.5–2 mm wide, surface at magnification covered with what appears to be collapsed tubercle-like units; units 10–30 µm across.

*Additional specimen examined:* QUEENSLAND; BOURKE DISTRICT: Amphitheatre, 40 km (by road) north of Musslebrook Mining Camp, 18°21'S 138°10'S, R.W. Johnson 779 and M.B. Thomas, 3.v.1995 (BRI).

*Notes:* *Boronia hoipolloi* can be distinguished from *B. lanuginosa* by sepals that are narrower and shorter than the petals, from *B. quinkanensis* by narrow leaflets (< 1 mm wide); and from *B. alulata* by a dense indumentum throughout.

*Distribution and ecology:* *Boronia hoipolloi* is known from two recent collections from the Amphitheatre, north of the Musslebrook Mining Camp, north-western Queensland. It is locally common and found in crevices on vertical sandstone cliff faces and sere slopes (collectors' notes). Flowering material was collected in May and June, fruiting material in June.

*Conservation status:* 2R (Duretto 1999).

### ***Boronia lanceolata* species-group**

*Branches* with a dense, stellate indumentum, becoming glabrous as they age. *Leaves* petiolate, imparipinnate or simple, adaxial surface glabrous or with a sparse to dense indumentum; leaflets or simple leaves, broad elliptic, acute, the margins plane to slightly recurved (sometimes revolute on drying), the midrib raised prominently on the abaxial surface and impressed on the adaxial surface, cells between midvein and abaxial epidermis with secondary thickening. *Inflorescence* 1-many-flowered, with a dense, stellate indumentum. Disc entirely within stamen whorl. Sepals acuminate to acute, abaxial surface with a dense, fawn stellate indumentum. Abaxial surface of petals sometimes with hairs that have firm, glossy, straight rays. Disc glabrous, entirely within stamen whorl.

Three species of central and north-western Queensland and the Northern Territory (Fig. 11) are placed in this informal group. The group is characterised by ovate-deltate sepals, petiolate leaves that have a prominently raised midribs with secondary thickening, and an umbellate inflorescence.

31. *Boronia duiganiae* Duretto, *Austrobaileya* 5: 292 (1999), fig. 14 L–Q. *Type:* Consuelo, 16 miles SW of Rolleston Township, *Lazarides* and *Storey* 116, l.ix.1961 (holotype CANB 112028; isotypes AD 96244143, BRI AQ121206, MEL 250602, NSW 238032).

Erect, much branched *shrub* to 2 m tall. Multiangular stellate hairs sessile with c. 10–25 rays; rays white to yellow, to 0.75(–1) mm long, firm and straight but becoming weak and flexuous as the hair ages. Branches with a dense, stellate indumentum, becoming glabrous as they age. *Leaves* (6–)13–45 mm long, (3–)6–35 mm wide in outline, with (1–)3–5 leaflets, the leaflet number per leaf increasing along branches; petiole 2–8 mm long, winged; rachis segments winged 4–10 mm long, 1–2 mm wide, elliptical or the distal end wider; leaflets sessile or with petiolule to 1 mm long, lamina elliptic to oblanceolate, obtuse, entire, plane or with a recurved to revolute margin, adaxial surface with a sparse to dense, stellate indumentum; terminal leaflet 6–31 mm long, 3–12 mm wide, longer than laterals; lateral leaflets 5–17 mm long, 2.5–8 mm wide. *Inflorescence*



1–3-flowered, with a dense, stellate indumentum; peduncle 0.5–1 mm long; prophylls minutely unifoliolate or minutely imparipinnate, 1–5 mm long, to 1.5 mm wide; metaxyphylls minute; anthopodium 1–2 mm long. Sepals ovate-deltate, acuminate to acute, 3.5–5 mm long, 2–3 mm wide, not enlarging significantly as fruit matures; adaxial surface densely and minutely pubescent and becoming glabrous towards base. Petals 6–11 mm long, 3–6 mm wide, enlarging slightly as fruit matures; adaxial surface with a sparse to moderately dense simple indumentum, becoming glabrous towards base; abaxial surface with a moderately dense to dense stellate indumentum. Filaments pilose; antesepalous filaments 2–2.5 mm long, prominently glandular on the distal 0.5–1 mm; antepetalous filaments tuberculate, c. 1.5 mm long; abaxial surface of anther frosty; anther-apiculum minute or large, reflexed. Style glabrous. *Cocci* 4–5.5 mm long, 2–3 mm wide, with a sparse to moderately dense indumentum. Seeds 4–4.5 mm long, 2–2.5 mm wide.

*Selected specimens examined (of 20 collections):* QUEENSLAND; LEICHHARDT DISTRICT: Mt Moffatt section of Carnarvon N.P. behind Tambo Bluff, 25°02'S 147°27'E, *M.B. Thomas* 137, 29.ix.1986 (BRI); 20 km from Springsure towards Rolleston, 24°13'S 148°14'E, *M.F. Duretto* 314–319, 10.ix.1992 (MFD314: BRI, CANB, MEL, NSW, PERTH; MFD315: AD, BRI, MEL, NSW; MFD316: BRI, CANB, MEL, NSW; MFD317, 318: BRI, CANB, MEL, NSW; MFD319: MEL); Hilltop, 9.35 km N of 1st Carnarvon Gorge turnoff and 125.35 km N of Injune, 24°32'S 148°31'E, *M.F. Duretto* 320–324, 326 and *M. Bayly*, 10.ix.1992 (MFD320: BRI, CANB, MEL, NSW, PERTH; MFD321: BRI, MEL; MFD322, 323: BRI, CANB, MEL, NSW; MFD324: AD, BRI, CANB, MEL, NSW; MFD326: MEL); Stonecroft Caves [c. 24°55'S 149°33'E] N of Taroom, *A.J. Gray* DMG4370, 26.vii.1958 (BRI); Mt Moffatt section of Carnarvon NP behind Tambo Bluff, 25°02'S 147°27'E, *M.B. Thomas* 137, 29.ix.1986 (BRI); Mt Moffatt turnoff to Kenniffs Cave, 25°01'S 147°57'E, *K.A. Williams* 86083, 29.ix.1986 (BRI); Near Dawson highway on Expedition Ra., 24°4.'S 149°0.'E, *R.E. Phillips*, 3.viii.1988 (BRI); Ceres holding, 10.8 km (by road) W of

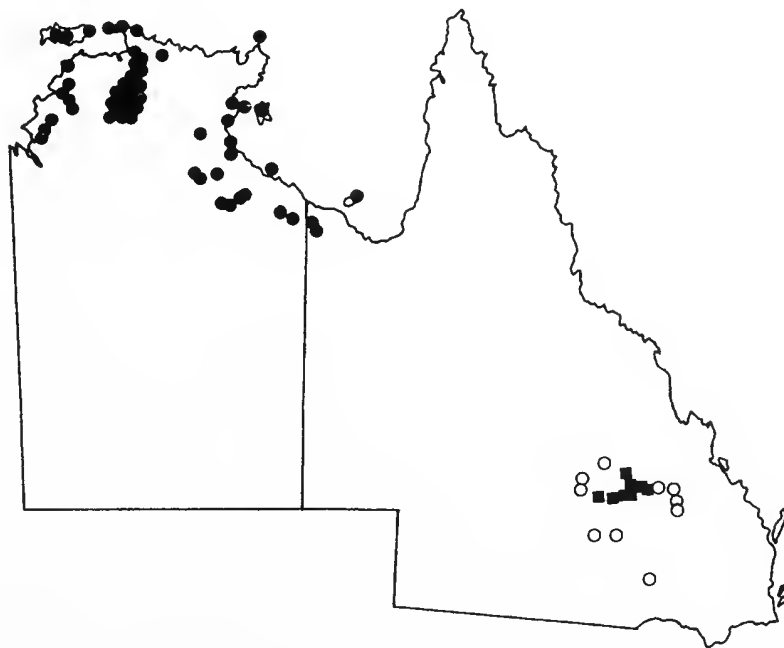


Fig. 11. Distribution of *Boronia lanceolata* species-group: *B. duiganiae* (■), *B. odorata* (○), *B. lanceolata* (●).

Rolleston-Injune RD at Christmas Ck Crossing, 24°48'S 148°29'E, *P.N. Martensz 1082A*, 25.viii.1978 (CANB); Orion Downs, *Dr Wuth* (MEL).

*Notes:* *Boronia duiganiae* can be distinguished from *B. odorata* and *B. lanceolata* by imparipinnate leaves on adult shoots and longer hairs (to 1 mm long) on the abaxial surface of the leaves and sepals; and from *B. obovata* by ovate-deltate sepals with a dense, fawn indumentum on the abaxial surface.

*Distribution and ecology:* *Boronia duiganiae* is restricted to the Great Dividing, Carnarvon and Expedition Ranges, south and south-west of Springsure and Rolleston, Queensland (Fig. 11). It is found growing in open woodland or forest on sandstone. Flowering: February–November; fruiting: September–November.

*Conservation status:* 2RC-: found in Carnarvon Range N.P. (Duretto 1999).

**32. *Boronia odorata*** Duretto, *Austrobaileya* 5:294 (1999), fig. 14 R-X. *Type:* Bull Creek Gorge, 15 km W of "Castlevalle", 24°30'S 146°52'E, *A.R. Bean 2194*, 3.ix.1990 (holotype BRI AQ474979; isotype NSW).

Erect, much branched *shrub* to 2 m tall. Multiangular stellate hairs with 5–25 rays; rays white to red-brown, to 0.05(–0.1) mm long. Branches with a dense, stellate indumentum, becoming glabrous as they age. *Leaves* subsessile to petiolate; petiole 1–8 mm long, winged; adult leaves simple, juvenile leaves petiolate, trifoliate for few nodes, leaflets initially glabrous, the density of the indumentum increasing with each node until as dense as adult leaves, leaflets similar to simple leaves; lamina, elliptic, obtuse, the margins plane to recurved (becoming revolute when drying); adaxial surface with a sparse to moderately dense stellate indumentum; simple, unifoliate and terminal leaflet (5–)12–40 mm long, (2–)4–8 mm wide, longer than laterals; lateral leaflets 10–15 mm long, 2–4 mm wide. *Inflorescence* 1–3(–7)-flowered, with a dense, stellate indumentum; peduncle 1–2 mm long; prophylls minutely unifoliate, 1–4 mm long, 0.5–2 mm wide, with a dense, stellate indumentum or indumentum as with leaves; metaxyphylls minute; anthopodium 1–7 mm long. Sepals ovate-deltate, acute to slightly acuminate, 2–4.5 mm long, 1–2.5 mm wide, not enlarging significantly as fruit matures; adaxial surface densely and minutely pubescent and becoming glabrous towards base. Petals (4–)6–10 mm long, 4–6 mm wide, enlarging to 8–11 mm long and 5–7 mm wide as fruit matures; adaxial surface with a moderately dense simple pubescence; abaxial surface with a moderately dense to dense stellate indumentum. Filaments pilose; antesealous filaments 2–2.5 mm long, the distal c. 1 mm prominently glandular; antepetalous filaments tuberculate, c. 1.5 mm long; antepetalous anther ± larger than antesealous anther before dehiscence, abaxial surface frosty; anther-apiculum large and reflexed. Style glabrous. *Cocci* (4–)5.5–7 mm long, (2–)3–3.5 mm wide, glabrous or sparsely hirsute. Seeds 3.5–5 mm long, 2.5–3 mm wide.

*Selected specimens examined* (of c. 40 collections): QUEENSLAND: Sandstone spurs of Expedition Range, ? *F. Mueller*, 9.ii.1847 (MEL); Near 'Glenlee', 27 miles WNW of Springsure Township, *L. Pedley 1751*, 13.x.1964 (BRI, CANB); 1.5 miles S of Ball Ck and Robinson Ck junction, Glenhaughton holding, *R.C. Clarkson*, 20.x.1974 (BRI); 26 km WSW of Bauhinia Downs on the Dawson Hwy towards Rolleston, 24°39'S 149°02'E, *M.F. Duretto 288-292*, *M. Bayly* and *N. Marsh*, 8.ix.1992 (*MFD288*: BRI, MEL, NSW; *MFD289*: AD, BRI, MEL; *MFD290, 291*: BRI, MEL; *MFD292*: BRI, CANB, MEL, NSW); Watershed 23 miles ESE of Rolleston Township, 24°35'S 148°56'E, *Lazarides* and *Storey 112*, 30.viii.1961 (BRI, CANB, MEL, NSW); W of Moura, *W.H. Jones 1814*, 10.iv.1961 (BRI); 6 miles W of 'Mt Playfair Station', Warrego District, 24°52'S 146°51'E, *Adams 1356*, 10.x.1964 (AD, BRI, CANB); Glenmore Gap, 13 km WSW of Theodore, 24°58'S 149°57'E, *Mora Map 8848-969354*, *P.I. Forster 2637*, 13.ix.1986 (BRI, CANB, MEL); 10 km S of Isla Gorge lookout, 37 km S by road from Theodore, 25°05'S 150°00'E, *L.A.S. Johnson 7203* and *B. G. Briggs*, 3.vi.1971 (BRI, NSW); Isla Gorge, c. 18 miles SW of Theodore,

25°09'S 149°57'E, *S.L. Everist* 8033, 28.ix.1968 (AD, BRI, CANB, NSW); E of car park and camping area, Isla Gorge NP, 25°12'S 149°59'E, *M.F. Duretto* 280-285, 7.ix.1992 (*MFD*280, 281: BRI, MEL; *MFD*282: BRI, CANB, MEL; *MFD*283: MEL; *MFD*284, 285: BRI, MEL, NSW); Claravale, c. 37 miles N of Mitchell on stony ridge [26°09'S 148°08'E], *R.W. Johnson* 2434, 30.v.1962 (BRI, CANB); SW boundary of Chesterfield NP, 26°13'S 147°20'E, *C. Dollery* 84, 29.vii.1995 (BRI); Mt Mobil Holding, 15-20 km W of Umberill Homestead, 26°14'S 147°25'E, *P. Grimshaw* *CHR*20, 8.xi.1990 (BRI); SE of Surat, Thomby Range, *S.T. Blake* 21293, 21.v.1960 (BRI, CANB, NSW, PERTH).

*Notes:* The Isla Gorge and Thomby Range populations of *B. odorata* differ from the typical populations to the north-west by the moderately dense indumentum on the adaxial surface of the leaves, as apposed to glabrescent to sparsely pubescent, and the acuminate sepals, instead of acute sepals (cf. Duretto 1999). This species can be distinguished from *B. duiganiae* by having simple adult leaves and shorter hairs (to 0.1 mm long) on the abaxial surface of the leaves and sepals, and from *B. lanceolata* by the larger flowers and hirsute stamens.

*Distribution and ecology:* *Boronia odorata* is restricted to the Central Highlands of Queensland in an area approximately bound by Springsure, Theodore, Surat, Mitchell and Tambo (Fig. 11). It grows in open woodland on sandstone. Flowering: February-October; fruiting: April-November.

*Conservation status:* Widespread and found in various reserves.

33. *Boronia lanceolata* F. Muell., *Fragm.* 1: 66 (1859). *Type:* M'Adam Ranges [Macadam Ra., c. 14°32'S 129°57'E, Northern Territory], *F. Muell.*, Oct 1855 (lectotype (Duretto 1997): K *n.v.* (cibachrome MEL 2041204; photographs of cibachrome BRI, DNA, NSW; photograph AD 99548113); isolectotype MEL 2049245); Arnhem Land [Northern Territory], *F. Muell.*, 1855 (residual syntypes K *n.v.* (cibachrome MEL 2041203), MEL); Pt Efingerstone [= Port Essington, 11°15'S 132°10'S, Northern Territory], *F. Mueller* (possible residual syntype MEL 2041255).

*Illustration:* K. Brennan, *Wildflowers of Kakadu*, 34 (1986).

Erect, rarely pendulous, much branched *shrub* to 2.5(-4) m high. Multiangular stellate hairs with c. 10-25 rays; rays white to faintly yellow, to 0.1 mm long. Branches with a moderately dense to dense stellate indumentum, becoming glabrous as they age. *Leaves* simple, 8-90 mm long, 3-27 mm wide, rarely in whorls of three; petiole 3-16 mm long; lamina narrowly elliptic to elliptic-lanceolate, acute,  $\pm$  slightly mucronate, cuneate to obtuse, the margins plane to slightly recurved; juvenile leaves simple, initially glabrescent with multiangular stellate hairs, the density of the indumentum increasing with each node until leaves as adult leaves with both multiangular and peltate stellate hairs; adaxial surface of adult leaves glabrous or glabrescent with hairs on the midrib only or with a dense, stellate indumentum of minute stellate hairs. *Inflorescence* 3-7(-15)-flowered, with a dense, stellate indumentum; peduncle 0.5-9 mm long; prophylls minutely unifoliate, 0.5-6 mm long, to 4 mm wide; metaxyphylls minute to 0.5 mm long; anthopodium 0.5-5 mm long. Sepals ovate-deltate, acuminate, 1-3 mm long, 1-2 mm wide, not enlarging significantly as fruit matures; adaxial surface glabrous to glabrescent with few stellate hairs near tip. Petals 2-5.5 mm long, 1.5-3 mm wide, enlarging to 2.5-7 mm long and 2-4 wide as fruit matures; adaxial surface with a sparse to moderately dense simple or stellate indumentum, becoming glabrous towards base; abaxial surface with a moderately dense to dense stellate indumentum. Filaments glabrous or rarely bearing few stiff simple hairs; antesepalous filaments 2-2.5 mm long, prominently glandular on the distal 0.5 mm; antepetalous filaments slightly to strongly

glandular distally, 1–1.5 mm long; abaxial surface of anther not frosty, anther-apiculum absent or rarely minute. Style glabrous. *Cocci* 3–4 mm long, 2–2.5 mm wide, glabrous with occasional stellate hair along suture. Seeds shiny but sometimes becoming dull, 2–3 mm long, 1.5–2 mm wide; tubercle surface smooth to wrinkled.

*Selected specimens examined (of c. 200 collections):* THE NORTHERN TERRITORY; VICTORIA RIVER DISTRICT: Vicinity of Woolaning Homestead, 13°06'S 130°40'E, L.A. Craven and C. Dunlop 6686 (CANB, DNA); 6 km SE of Macadam Range, 14°35'22"S 129°59'49"E, I. Cowie 4938 and D.E. Albrecht, 12.v.1994 (DNA, MEL); DARWIN and GULF COUNTRY: E end of Melville Is., 1.5 km N of Soldier Point, 11°28'S 131°32'E, P.A. Fryxell, L.A. Craven and J. McD.Stewart 4916, 25.vi.1985 (CANB, DNA, MEL); Channel Is., Darwin Harbour, N. Byrnes 2376, 3.ii.1972 (CANB, DNA); Buffalo R. Crossing, Cobourg Peninsular, 11°22'S 132°30'E, D. Silvertown 860, 4.vi.1983 (DNA); c. 25 km SE of Murganella along the track to Oenpelli, 11°37'S 133°5'E, J.Z. Weber 10087, 5.vi.1988 (AD, MEL); Wilgran Is., English Company Is's, 11°45'S 136°37'E, G.J. Leach 3072, 24.vii.1992 (CANB); 6.5 km SSW of Mt Brockman, 12°48'S 132°56'E, I.R. Telford 8041 and J.W. Wrigley, 23.iv.1980 (CANB, NSW); Deaf Adder Gorge, 13°07'S 132°56'E, I.R. Telford 7999 and J.W. Wrigley, 22.iv.1980 (CANB, DNA, NSW); Top of UDP falls, Waterfall Ck, Kakadu NP, 13°25.84'S 132°25.03'E, M.F. Duretto 476 and J. Chappill, 18.vi.1993 (MEL); Ikoymarra Lookout, c. 9 km W of Mary R. crossing on Jabiru Rd, Kakadu NP, 13°34.61 S 132°15.34'E, M.F. Duretto 533-537, J. Chappill and G. Howell, 29.vi.1993 (MFD533-535, 537 : MEL; MFD536: DNA, MEL); On Loop Track, near first swimming hole, Edith Falls, Nitmiluk NP, 14°10.89'S 132°11.59'E, M.F. Duretto 532 and J. Chappill, 29.vi.1993 (BRI, DNA, MEL); Angurugu, Groote Eylandt, 13°58'S 136°27'E, J. Waddy 464, 17.xi.1975 (DNA); Collara Mtns, E of Ngukurr, 14°40'S 134°57'E, J. Russell-Smith 4275 and Lucas, 29.xi.1987 (DNA); Maria Is., Gulf of Carpentaria, 14°54'S 135°44'E, C. Dunlop 2903, 20.vii.1972 (CANB, DNA); Yiyintyi Range, Lorella Station, 15°25'S 135°40'E, P.L. Wilson 22, 14.vi.1986 (DNA); Near Echo Waterhole, c. 34 km W of Wollgorang Station, 35 km SW of Homestead, 17°10'S 137°40'E, R. Pullen 9225, 12.v.1974 (CANB, DNA, NSW); QUEENSLAND; BURKE DISTRICT: Appel Channel, Mornington Is., Wellesly Is's, Gulf of Carpentaria, 16°29'S 139°34'E, N.B. Tindale and P. Aiken, vi.1963 (AD); Hells Gate, 17°27'S 138°22'E, S. Jacobs 1525, 9.v.1974 (BRI, CANB, NSW, PERTH).

*Notes:* *Boronia lanceolata* is the most common *Boronia* in the Northern Territory and north-western Queensland. It is variable in leaf shape, size and indumentum (see Duretto 1997). A notable variant includes small-flowered, pendulous plants from Deaf Adder Gorge (e.g. Telford 7999). Further collections and research are needed to ascertain the taxonomic status of this population.

*Boronia lanceolata* differs from *B. duiganiae* and *B. odorata* by homoblastic simple leaves (juvenile and mature), small flowers and glabrous to glabrescent staminal filaments.

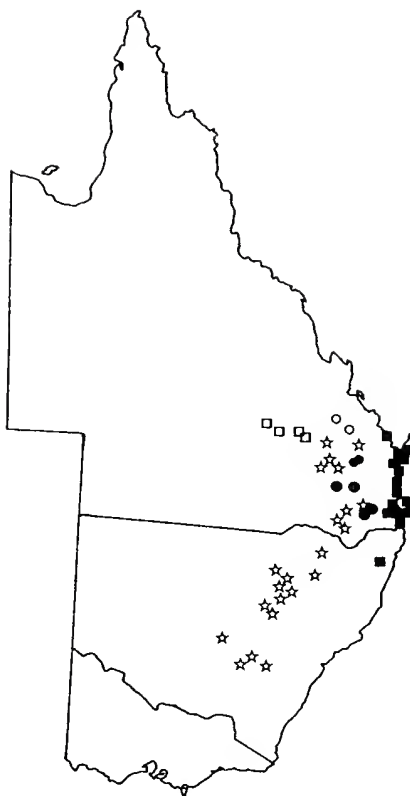
*Distribution and ecology:* *Boronia lanceolata* occurs from Mornington Island and Westmoreland, Queensland, to the Macadam Ranges, Northern Territory, including near coastal islands (Fig. 11). It is found in sandstone monsoon forest, woodland and heath communities. Flowering and fruiting: May-February.

*Conservation status:* Widespread, found in some conservation reserves, and not under immediate threat (Duretto 1997).

### ***Boronia rosmarinifolia* species-group**

*Branches* with a moderately dense to dense stellate indumentum, becoming glabrous as they age. *Leaves* sessile, simple, adaxial surface glabrous or with few hairs on the midrib, margin plane to revolute, midvein raised slightly on the abaxial surface and impressed slightly on the adaxial surface, cells between the midvein and the abaxial epidermis





**Fig. 12.** Distribution of *Boronia rosmarinifolia* species-group: *B. rosmarinifolia* (■), *B. splendida* (●), *B. palasepala* (○), *B. forsteri* (□), *B. glabra* (☆).

without secondary thickening. *Inflorescence* 1(–3)-flowered, with a dense, stellate indumentum. Disc entirely within stamen whorl. Sepals ovate-deltate, abaxial surface with a dense, fawn indumentum. Disc glabrous, entirely within stamen whorl.

This informal group is characterised by sessile, simple leaves without secondary thickening in the cells of the abaxial midrib, and includes five species of southern Queensland and New South Wales (Fig. 12). This species group, apart from *B. glabra*, was subject to a phenetic analysis to determine the taxonomic limits of its members (Duretto 1999). Further collections are needed in inland areas to test the robustness of this classification, especially in the areas between the main populations of *B. splendida* and *B. palasepala*.

- 34. *Boronia rosmarinifolia*** A. Cunn. ex Endl., *Enum. pl.* 16 (1837). *B. ledifolia* var. *rosmarinifolia* (A. Cunn. ex Endl.) Benth., *Fl. austral.* 1: 314 (1863). *Type Citation*: “Peel’s Island, Moreton Bay. (A. Cunningham. 1824)” (holotype W? n.v.). Description decisive.

*Illustrations*: B.A. Lebler, *Queensland Agric. J.* 98: 196 (1972); K.A.W. Williams, *Native Plants Queensland* 1: 37 (1979); L. Cronin, *Consise Australian Fl.*, 80 (1989); P.H. Weston and M. Porteners, *Fl. New South Wales* 2: 232 (1991); M.F. Duretto *Austrobaileya*: 276 (1999).

Erect or weakly ascending, much branched *shrub* to 1 m tall, resprouting from rootstalk. Multiangular stellate hairs with c. 5–10 rays; rays white to yellow, to 0.05(–0.1) mm long. *Leaves* 6–30 mm long, 1–4.5 mm wide, rarely in whorls of three, elliptic to obovate, obtuse, the margins recurved or plane; juvenile leaves larger than adult leaves, to 48 mm long and 10 mm wide, initially glabrescent with multiangular stellate hairs then the density of the indumentum increasing with each node until as adult leaves. *Inflorescence* 1(–3)-flowered, with a moderately dense to dense stellate indumentum; peduncle absent or to 0.5 mm long; prophylls minutely unifoliolate, 1.5–2 mm long, to 0.5 mm wide; metaxephylls minute to 0.5 mm long; anthopodium 1–6 mm long. Sepals ovate-deltate, acute, 2–4 mm long, 1.5–2.5 mm wide, enlarging slightly as fruit matures. Petals 5–7.5 mm long, 3–4 mm wide, enlarging to 8–10 mm long and 6 mm wide as fruit matures; adaxial surface with a sparse to moderately dense simple pubescence; abaxial surface with a moderately dense to dense stellate indumentum. Antesepalous filaments c. 2 mm long, prominently glandular on the distal 0.5–1 mm; antepetalous filaments tuberculate, c. 1.5 mm long; abaxial surface of anther frosty; anther-apiculum large, reflexed. Style glabrous. *Cocci* 4–5.5 mm long, 2.5–3.5 mm wide, glabrous (rarely densely hirsute). Seeds 4–4.5 mm long, 2–2.5 mm wide. *Rosemary Boronia*, *Forest Boronia* or *Possum Boronia*.

*Selected specimens examined (of c. 50 collections):* QUEENSLAND; BURNETT DISTRICT: Curtis Rd, Kingaroy, 26°31'S 151°52'E, A.R. Bean 10650, 9.ix.1996 (MEL); WIDE BAY DISTRICT: Elliot R., near Bundaberg, J. Olsen 330, 16.v.1967 (NSW); Fraser Is., between Lake Birraheen and Lake Boemingen, 25°32'S 153°04'E, D.A. Smith 7, 15.viii.1971 (MEL); Rainbow Beach Rd towards Rainbow Beach, c. 300 m inside Cooloola NP opposite sandstone hill, 26°01'S 153°00'E, M.F. Duretto 258–260, M. Bayly and N. Marsh, 3.ix.1992 (MFD258: BRI, MEL, NSW; MFD259, 260: MEL); MORETON DISTRICT: 4 km S of Sunshine Beach turnoff along coast Rd S of Noosa Heads, 100m along track heading W opposite car park, 26°28'S 153°06'E, M.F. Duretto 253–257, M. Bayly and N. Marsh, 3.ix.1992 (MFD253, 255: MEL; MFD254, 257: BRI, MEL; MFD256: BRI, MEL, NSW); Moreton Is., F. Mueller, viii.1855 (MEL, TCD); Brisbane R., A. Dietrich, 1863–1865 (AD); Collingwood Park near Ipswich, 27°37'S 152°52'E, L.H. Bird, 7.vii.1990 (BRI, CANB, MEL); North Stradbroke Is., c. 27°28'S 153°30'E, V.K. Moriarty 415, 20.viii.1970 (CANB); Mt Tamborine, E. Cheel, 31.v.1930 (NSW); NEW SOUTH WALES: NORTH COAST: Fortis Ck, 24 km N of Grafton on the road to Coaldale, D.B. Foreman No. 907, 23.viii.1985 (CANB, MEL); 9 km from Grafton-Coaldale Rd on Stockyard Ck Rd, 29°27'S 152°49'E, K. Hill 2757, L.A.S. Johnson and P. Weston, 19.x.1987 (NSW).

*Notes:* Normally *B. rosmarinifolia* has glabrous fruit, but very rarely a plant may have densely hirsute fruit as in *B. forsteri* and *B. glabra*. This feature is not considered to be of any significant taxonomic importance (see Duretto 1999). *Boronia rosmarinifolia* is most closely related to *B. splendida* and *B. palasepala* from which it can be distinguished by its smaller flowers and leaves. It can be distinguished from *B. forsteri* by its larger flowers and leaves, reflexed anther-apicula and usually glabrous fruits, and from *B. glabra* by having glabrous fruits and leaves with a dense indumentum on the abaxial surface, and from *B. chartacea* (North Coast, NSW) by its sessile leaves.

*Distribution and ecology:* *Boronia rosmarinifolia* is found from Bundaberg, Wide Bay District, Queensland, to Grafton, North Coast, New South Wales (Fig. 12), where it can be common in coastal heath (wallum) and woodland communities on well drained sand or sandstone-derived soils. Flowering and fruiting: May–December.

*Conservation status:* Common, widespread and found in several conservation reserves and under no immediate threat.

**35. *Boronia splendida*** Duretto, *Austrobaileya* 5: 278 (1999), fig. 9 G–L. *Type:* Falls Ck, 4 km NW of Haldon, Helidon 9342-084285, 27°45'S 152°04'E, P.I. Forster 4762

and L.H. Bird, 2.x.1988 (holotype MEL 1575271; isotypes AD 99120272, BISH n.v., BRI AQ429500, CANB (CBG 8908090), K n.v., MO n.v.).

Erect, much branched *shrub* to 2.5 m tall, resprouting from rootstalk. Multiangular stellate hairs with c. 5–10 rays; rays white to yellow, to 0.05(–0.1) mm long. *Leaves* 9–50 mm long, 1–2(–4) mm wide, linear to narrowly elliptic, obtuse, attenuate, the margins strongly revolute so that the abaxial surface of the leaf is usually not visible. *Inflorescence* 1(–3)-flowered, with a dense, stellate indumentum; peduncle to 0.5 mm long; prophylls minutely unifoliolate, 0.5–3 mm long, to 0.5 mm wide, with a dense, stellate indumentum, or as leaves; metaxephylls minute to 0.5 mm long; anthopodium 2–6 mm long. Sepals ovate-deltate, acute, 2.5–4(–6) mm long, 2.5–4 mm wide. Petals (6–)8–13 mm long, 4.5–6 mm wide, enlarging to 12–14 mm long and 6–7 mm wide as fruit matures; adaxial surface with a moderately dense simple pubescence; abaxial surface with a moderately dense stellate indumentum. Antesepalous filaments c. 1.5 mm long, prominently glandular on the distal 0.5 mm; antepetalous filaments slightly tuberculate, c. 1 mm long; anther-apiculum large, reflexed. Style hirsute or glabrous. *Cocci* 5–6 mm long, 2.5–3 mm wide, glabrous. Seeds c. 4 mm long, c. 2 mm wide.

*Selected specimens examined (of 14 collections):* QUEENSLAND: BURNETT DISTRICT: Mundubbera, 9146-374346, 1.5 km W of 'Mimosa' Homestead, 25°54'S 151°23'E, *P.I. Forster* 2243, 28.ix.1985 (BRI); 8 km W of 'Manar' Homestead, Boondooma, 26°01'S 151°18'E, *P.I. Forster* 4647, 4.viii.1988 (BRI, CANB); Beeron Holding, 5 km W of Toondahra Homestead, 25°58'S 151°20'E, *P.I. Forster* 11202 and *P.R. Sharpe*, 9.ix.1992 (BRI, MEL); Beeron Holding, 25°59'S 151°20'E, *P.I. Forster* 19603 & *T. Ryan*, 11.ix.1996 (BRI n.v., MEL); Stalworth Rd, north of Proston, 26°07'S 151°36'E, *A.R.Bean* 10670, 10.ix.1996 (MEL); DARLING DOWNS DISTRICT: Lang tree Paddock, Toondahra, boundary fence with 'Blackdown' homestead, 26°5-'S 151°2-'E, *P.I. Forster* 1740, 17.iii.1984 (CANB); 4.8 km E of Tarra turn off, and 5.3 km E of Kogan on Condamine Hwy, near dog fence, c. 27°02'S 150°46'E, *M.F. Duretto* 337-344, *M. Bayly* and *N. Marsh*, 13.ix.1992 (MFD337: AD, BRI, CANB, MEL, NSW, PERTH; MFD338: BRI, CANB, MEL; MFD339, 342-344: MEL; MFD340: BRI, CANB, MEL, NSW; MFD341: BRI, MEL, NSW); East Egypt, 25 km SW of Grafton, 27°40'S 152°07'E, *L.H. Bird*, 11.x.1991 (BRI, CANB).

*Notes:* *Boronia splendida* can be distinguished from *B. forsteri*, *B. palasepala*, and *B. rosmarinifolia* by its tall stature, and the revolute, long and narrow leaves, and large flowers.

*Distribution and ecology:* *Boronia splendida* occurs in the Condamine-Kogan area, and north to 'Mimosa' homestead c. 50 km S of Mundubbera, Queensland (Fig. 12), where it is found on sandstone derived soils in eucalypt and acacia woodland. Flowering: March–November; fruiting: November.

*Conservation status:* 2R (Duretto 1999).

- 36. *Boronia palasepala*** Duretto, *Austrobaileya* 5: 280 (1999), fig. 9 M-R. *Type:* Coomingleh State Forest 28, Burnett District, Qld, c. 24°51.5'S 150°56'E, Grid Ref. 9048-916493, *M.F. Duretto* 277, *M. Bayly* and *N. Marsh*, 6.ix.1992 (holotype MEL 2036610; isotypes AD, BRI, CANB, HO, K, MEL 2036611, MEL 2036612, NSW, PERTH).

Erect, much branched *shrub* to 2 m tall and wide, resprouting from rootstalk. Multiangular stellate hairs with c. 5–10 rays; rays white to yellow or red, to 0.25(–0.5) mm long. *Leaves* 14–42 mm long, 2–6 mm wide, elliptic to obovate, obtuse, attenuate; the margins plane to recurved (revolute on drying). *Inflorescence* 1(–3)-flowered, with a moderately dense to dense stellate indumentum; peduncle to 0.5 mm long; prophylls minutely unifoliolate, 1–3 mm long, 0.5–1 mm wide, with a dense, stellate indumentum,

or as leaves; metaxyphylls minute 0.5–1.5 mm long; anthopodium 1–3(–5 in *Biloela* specimens) mm long. Sepals broadly ovate-deltate, acuminate, (3–)4–6 mm long, (2–)3–4 mm wide. Petals 8–10.5 mm long, 4.5–6 mm wide; adaxial surface with a moderately dense simple pubescence; abaxial surface with a moderately dense stellate indumentum. Antesepalous filaments c. 2 mm long, prominently glandular on the distal 0.5–1 mm; antepetalous filaments tuberculate, c. 1.5 mm long; anther-apiculum absent or minute. Style glabrous. *Fruit* and seed not seen.

*Additional specimens examined (of 6 collections):* QUEENSLAND; BURNETT DISTRICT: 15 km NE of Biloela, 3 km N of Callide dam, *E.J. Thompson BIL10*, 3.vii.1992 (AD, PERTH); Coomingleh State Forest 28, 24°55'S 150°59'E, *P.I. Forster 6906* (BRI, CANB, MEL, NSW).

*Notes:* *Boronia palasepala* can be distinguished from other members of the *B. rosmarinifolia* species complex by its large flowers, usually wide and recurved leaves (becoming revolute on drying), usually spade-shaped sepals, and the absent or minute anther-apiculum.

*Distribution and ecology:* *Boronia palasepala* occurs near Biloela and in Coomingleh State Forest (SF28, near Monto), Queensland (Fig. 12). It is found growing on sandstone in eucalypt open forest or woodland, often locally abundant. Flowering: July–September.

*Conservation status:* 2R (Duretto 1999).

- 37. *Boronia forsteri*** Duretto, *Austrobaileya* 5: 280 (1999), fig. 9 S-X. *Type:* 7 km past Glenhaughton Homestead on Mapala Rd, SF46, Leichhardt District, 25°21'S 149°19'E, *P.I. Forster 11235* and *P.R. Sharpe*, 10.ix.1992 (holotype MEL; isotypes BRI AQ561403, CANB, NSW).

*Boronia* sp. (Robinson Gorge *P.I. Forster+ PIF11235*) *sensu* Forster (1997, p. 185).

Erect, much branched *shrub* to 1(–2) m tall. Multiangular stellate hairs with 5–10 rays; rays white to yellow, to 0.1 mm long. *Leaves* 6–25 mm (to 35 mm long in juvenile leaves) long, 0.5–5 mm wide, elliptic to obovate, obtuse, attenuate, the margins plane or slightly recurved; juvenile leaves glabrous or with a sparse indumentum on the abaxial surface. *Inflorescence* 1(–3)-flowered, with a moderately dense to dense stellate indumentum; peduncle to 0.5 mm long; prophylls minutely unifoliate, 1.5–2.5 mm long, to 0.5 mm wide; metaxyphylls minute to 0.5 mm long; anthopodium 1.5–3 mm long. Sepals ovate-deltate, acute, 2–2.5 mm long, 1–1.5 mm wide, enlarging to 3 mm long as fruit matures. Petals 4–6 mm long, 2–3 mm wide, enlarging to 7–8 mm long and 5 mm wide as fruit matures; adaxial surface sparsely simple pubescent; abaxial surface with a moderately dense to dense stellate indumentum. Antesepalous filaments c. 1.5 mm long, prominently glandular on the distal 0.5 mm; antepetalous filaments tuberculate, c. 1 mm long; anther-apiculum large and erect. Style glabrous. *Cocci* 5–6 mm long, 2.5–3 mm wide, with a moderately dense to dense simple indumentum. Seeds 4.5–5 mm long, 2–2.5 mm wide.

*Selected specimens examined (of 14 collections):* QUEENSLAND; LEICHHARDT DISTRICT: Marlong Arch-Thombs area, 25°05'S 147°52'E, *J. Benyon*, 13.ix.1978 (CANB); Gwambagwinc, Ruined Castle Ck catchment, 25°13'08"S 149°27'02"E, *P.I. Forster 17836*, *S.J. Figg* and *F. Carter*, 20.ix.1995 (BRI n.v., MEL); 5 km past Glenhaughton Homestead on Mapala Rd, SF46, 25°21'S 149°09'E, *P.I. Forster 9753* and *P. Manchin*, 10.iv.1992 (BRI n.v., MEL); 500 m N of Robinson Gorge, c. 25 km NW of 'Glenhaughton' Homestead, 25°11'S 149°12'E, *I.R. Telford 5635* (CANB); Starckvale Ck, Expedition NP, 25°18'34"S 149°10'53"E, *P.I. Forster 17714* and *S.J. Figgs*, 16.ix.1995 (BRI n.v., MEL); 11 km past Glenhaughton Homestead on Mapala Rd, 25°18'S 149°17'E, *P.I. Forster 11453* and *P.R. Sharpe*, 14.ix.1992 (BRI, MEL); 21 miles SE of Badourie, *N.H. Specht 1854*, 14.x.1963 (BRI); 11.8 km N of 'Yoothapinna', Injune District, 25°15'S 148°20'E, *C. Gittens 2745*, 4.ix.1974 (BRI, NSW).



*Notes:* *Boronia forsteri* is similar to *B. rosmarinifolia* from which it can be distinguished by its smaller flowers, erect anther-apicula and hirsute cocci. It may co-exist with *B. glabra* from which it can be distinguished by having a dense indumentum on the abaxial surface of the leaves.

*Distribution and ecology:* *Boronia forsteri* occurs in the Chesterton, Carnarvon and Expedition Ranges, Central Highlands, Queensland (Fig. 12). It is found in dissected sandstone country in eucalypt open woodland or forest. Flowering and fruiting: September–October.

*Conservation status:* 2RC-: occurs in Expedition Range N.P. and Carnarvon N.P. (Duretto 1999).

38. *Boronia glabra* (Maiden & Betche) Cheel, *J. Proc. Roy. Soc. New South Wales* 61: 411 (1928). *Boronia ledifolia* var. *glabra* Maiden & Betche, *Proc. Linn. Soc. New South Wales* 23: 773 (1898). *Type Citation:* "Harvey Ranges, near Peak Hill, N.S.W. (J.H. Maiden, September, 1898)." *Type:* Harvey Ranges near Peak Hill, N.S.W., J.H. Maiden, ix.1898 (lectotype, here designated, NSW 420276; isoelectotype K n.v., MEL 268306); Dubbo-Tomingley, J.H. Maiden, ix.1898 (residual syntype NSW; residual isosyntype MEL 258536).

*Boronia* sp. B (*aff. rosmarinifolia*) *sensu* Jacobs and Pickard (1981, p. 191).

*Illustrations:* K.A.W. Williams, *Native Plants Queensland* 1: 33 (1979); G.M. Cunningham *et al.*, *Pl. W. New South Wales*, 444 (1981); L. Cronin, *Consise Australian Fl.*, 80 (1989); P.H. Weston and M.F. Porteners, *Fl. New South Wales* 2: 233 (1991).

Erect, or weak, much branched *shrub* to 1.5(–3) m tall, resprouting from rootstalk. Multiangular stellate hairs with c. 3–15 rays; rays white, to 0.1 mm long. *Leaves* (2.5–)5–35 mm long, (0.5–)1.5–7 mm wide, elliptic, obtuse; the margins plane to recurved, sometimes revolute, glabrous to stellate glabrescent (rarely with a dense indumentum of stellate hairs on the adaxial and/or abaxial surface). *Inflorescence* 1-flowered, with a moderately dense stellate indumentum; peduncle 0.5–2 mm long; prophylls minutely unifoliate, 0.5–1.5 mm long, 0.5–1 mm wide, with a sparse indumentum; metaxyphylls minute to 0.5 mm long; anthopodium 1.5–6 mm long. Sepals ovate-deltate, acute, 2.5–3 mm long, 1–2 mm wide, not enlarging significantly as fruit matures. Petals 4–7 mm long, 2.5–3.5 mm wide, enlarging to 7–10 mm long and 3.5–4 mm wide as fruit matures; adaxial surface glabrescent or with a sparse to moderately dense simple pubescence, becoming glabrous towards base; abaxial surface with a moderately dense to dense stellate indumentum. Antesepalous filaments 1.5–2 mm long, prominently glandular on the distal 0.5 mm; antepetalous filaments slightly tuberculate, 1–1.5 mm long; anther-apiculum large, erect or reflexed. Style glabrous. *Cocci* (4–)5–6 mm long, 2–3 mm wide, densely hirsute. Seeds 3.5–5 mm long, 2–2.5 mm wide. *Smooth Boronia*, *Blotched Boronia* or *Sandstone Boronia*.

*Selected specimens examined (of c. 100 collections):* QUEENSLAND; LEICHHARDT DISTRICT: Marlong Arch-Thombs area, 25°05'S 147°52'E, *J. Benyon* 13.ix.1978 (CANB); 16 km N of Olilgy Corner on the Injune-Consuelo Tableland Rd, *J. Armstrong* 1012 and *D.F. Blaxell*, 2.ix.1977 (CANB, NSW); Woleebe Rd, 20 km N of Gurulmindi, 26°17'S 154°54'E, *K.A. Williams* 77175, 12.vii.1977 (BRI, CANB); BURNETT DISTRICT: 16 miles SSW of Cracow Township, *M. Lazarides* 6945, 10.vii.1963 (AD, CANB, MEL); Nathan Gorge, SW of Cracow, Grid Ref. 8947-853843, 25°25'S 150°10'E, *P.I. Forster* 7166, 22.viii.1990 (BRI, CANB, MEL); DARLING DOWNS DISTRICT: Barakula SF, 2 km N of Charlies Ck (near office), 26°26'S 150°31'E, *M.F. Duretto* 330-334, *M. Bayly* and *N. Marsh*, 13.ix.1992 (MFD330: BRI, CANB, MEL, NSW,

PERTH; *MFD331*: AD, BRI, CANB, MEL, NSW, PERTH; *MFD332*: BRI, CANB, MEL, NSW; *MFD333*, *334*: BRI, MEL, NSW); Ridge just S of Coolminda Dam, via Inglewood, *Mrs H.G. Wright*, 4.x.1974 (BRI); NEW SOUTH WALES: NORTHERN TABLELANDS: Nandewar Mtn, *J.W. Vickery* and *L.R. Frase*, 7.x.1964 (NSW); NORTH WEST SLOPES: Near Warialda, 29°32'S 150°35'E, *T.M. Whaite 1031*, 31.viii.1951 (CANB, MELU, NSW, PERTH); Pilliga Scrub, 50 km SW of Narrabri, 30°21'S 148°53'E, *E.M. Wallaston*, 21.vii.1976 (AD); 76 km SSW of Narrabri by road toward Coonabarrabran, 30°55'S 149°26'E, *R. Coveny 9037* and *S.K. Roy*, 23.xi.1976 (CANB, MELU, NSW); Trinkey SF, c. 48 km S of Gunnedah, *B. Kennedy*, viii.1976 (NSW); Cobar, Lachlan R., *Hans Andrae 335*, 1887 (MEL); On Pilliga Forest Way, 2.9 km NE of Country Rd, Pilliga East SF, 30°38.73'S 149°17.84'E, *M. Bayly 198* and *P. Neish*, 26.viii.1993 (MEL); Pilliga East SF, c. 5 km SW Schwaggers Bore, 30°38'S 149°18', *D.F. Mackay 988*, 22.ix.1986 (NE, NSW); Pilliga Scrub, Forest Way, c. 25 km W of Newell Hwy, 30°38'S 149°24'E, *N.G. Walsh 1336*, 14.viii.1984 (MEL, CANB, NSW); Pilliga Scrub, c. 80 km NE of Coonamble, *R. Jordon*, viii.1953 (AD); CENTRAL WEST SLOPES: Goonoo SF, c. 32 km SW of Mendooran on Franzers Rd, 1 km S of Garlings Rd on Compartments 52/53 boundry, 32°00'S 148°55'E, 8634-821568, *J.D. Briggs 2383*, 18.ix.1988 (CANB, MEL); c. 28.4 km from Gooloogong on Kangaroo Rd, 33°50'S 148°55'E, *M.A. Clements 3540*, 16.x.1984 (CANB); Yellow Mtn, Condobolin, *P.L. Mithorpe 4738* and *G.M. Cunningham*, 5.x.1976 (NSW); Barryrenci, 20 km NW of Cowra, *E.J. McBarron 20800*, (NSW); Weddin Range, 16 km SW of Grenfell, 33°58'S 148°00'E, *R. Coveny 5225*, 11.x.1973 (NSW); Goonoo Forest approx 4 miles E of HQ along Mendooran Rd (NNE of Dubbo), *J.H. Willis*, 9.x.1969 (MEL, NSW); Burbong near Gilgandra, *McReadie*, 2.xii.1960 (NSW).

*Notes*: Specimens of *B. glabra* with hirsute leaves (e.g. *Andrae 335*, *Walsh 1336*, *Bayly 198*) from the Pilliga Scrub and Goonoo areas (Western Slopes, NSW, = *B. sp. B* (aff. *rosmarinifolia*), *Jacobs and Pickard 1981*; see also *Weston 1990*, *Weston and Porteners 1991*) superficially resemble *B. rosmarinifolia* but are either aberrant individuals of *B. glabra* or a taxon closely related to *B. glabra*. They occupy a different local habitat to that of *B. glabra* (*D. Mackay*, NE, pers. comm.) and the status of this form is being assessed by *D. Mackay*.

*Boronia glabra* can be distinguished from other east coast species of *Boronia* by its sessile, simple and usually glabrous leaves with smooth margins and its hirsute fruit.

*Distribution and ecology*: *Boronia glabra* is common and widespread in inland regions from Eidsvold, Queensland, to Cowra, New South Wales (Fig. 12) and is the most common boronia on the western slopes of New South Wales and in the Darling Downs, Burnett and Maranoa Districts of Queensland. It is found in open forest or woodland on sandstone, granite or sand.

*Conservation status*: Common, widespread, but not known if adequately represented in conservation reserves. Not under threat but very rarely collected in the southern-most part of its range (see *Cunningham et al. 1981*).

### ***Boronia foetida* species-group**

*Branches* with a dense, stellate indumentum, becoming glabrous as they age. *Leaves* simple, strongly attenuate, broad elliptic or narrowly elliptic or slightly lanceolate, acute, ± mucronate, adaxial surface glabrous or with few hairs on the midrib, the margins plane to slightly recurved (sometimes revolute on drying), the midrib raised prominently on the abaxial surface and impressed on the adaxial surface, cells between midvein and abaxial epidermis with secondary thickening. *Inflorescence* 1(–3)-flowered, with a dense, stellate indumentum. Sepals acuminate (rarely acute), abaxial surface with a dense, fawn stellate indumentum. Disc glabrous, entirely within stamen whorl.

An informal group of four rare species of Queensland (Fig. 13) characterised by simple leaves that are large, broad, elliptical, attenuate, adaxial surface glabrous, and the prominently raised midribs on the abaxial surface, and by the acuminate sepals.

39. *Boronia jensziae* Duretto, *Austrobaileya* 5: 292 (1999), fig. 11 A-F. Type: c. 300 m S of Banksia Bay turn off along the East Coast Trail between Little Ramsey and Zoe Bays, Hinchinbrook Is., N Qld, 18°21.73'S 146°18.65'E, *M. Duretto* 406, 29.v.1993 (holotype MEL 2037448; isotypes AD, BRI, CANB, DNA, K, MEL 2037449, NSW).

*Boronia* sp. *sensu* Williams (1984, p. 58).

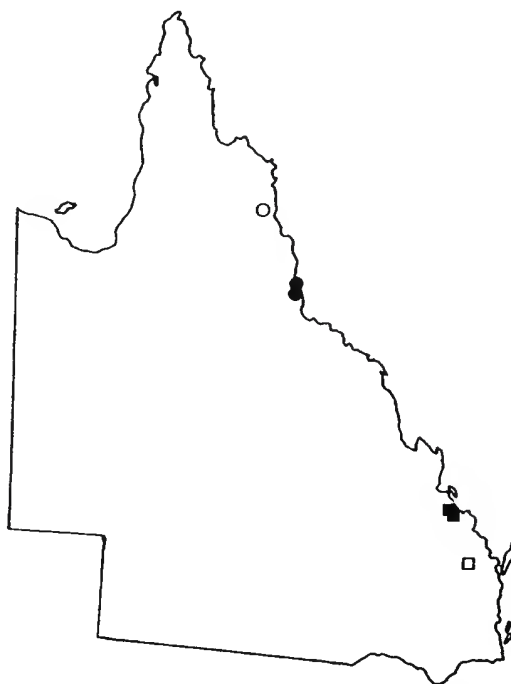
*Boronia* sp. 'Hinchinbrook Is.' *sensu* Thomas and McDonald (1987, p. 49; 1989, p. 46).

*Boronia* sp.1 (Hinchinbrook Island; *S.L. Everist* 7786) *sensu* Briggs and Leigh (1996, p. 167).

*Boronia* sp. (Hinchinbrook Is. *S.L. Everist* 7786) *sensu* Forster (1997, p. 185).

*Illustration*: K.A.W. Williams, *Native Plants Queensland* 2: 58 (1984, as *Boronia* sp.).

Erect, much branched *shrub* to 2 m tall, resprouting from rootstalk. Multiangular stellate hairs with 8–15 rays; rays white to yellow, 0.05–0.1 (–0.25) mm long. *Leaves* (10–)15–45 mm long, (4–)6–11.5 mm wide; petiole 2–4 mm long; lamina elliptic, acute and  $\pm$  mucronate, attenuate, the margins plane to slightly recurved, subsessile to petiolate; juvenile leaves simple. *Inflorescence* 1-flowered; peduncle 0.5–1 mm long; prophylls minutely unifoliate, 2–2.5 mm long, 0.5–1 mm wide, with a dense, stellate indumentum, or as leaves; metaxyphylls 0.5–1 mm long; anthopodium 2–5 mm long. Sepals c. 4 mm long, c. 2.5 mm wide, not enlarging significantly as fruit matures. Petals 5.5–7 mm long, 3–3.5 mm wide, enlarging to 7.5–8.5 mm long as fruit matures; adaxial



**Fig. 13.** Distribution of *Boronia foetida* species-group: *B. jensziae* (●), *B. excelsa* (○), *B. foetida* (□), *B. bella* (■).

surface with a sparse simple indumentum and becoming glabrous towards base; abaxial surface with a moderately dense to dense stellate indumentum. Filaments sparsely to moderately pilose; antesealous filaments c. 2 mm long, prominently glandular on the distal 0.5–1 mm; antepetalous filaments slightly tuberculate, c. 1.5 mm long; anther-apiculum minute to large, reflexed. Style glabrous. *Cocci* 4–4.5 mm long, 2–3.5 mm wide, glabrous. Seeds 2.5–3.5 mm long, 1.5–2 mm wide. *Andy Jenz's Boronia* or *Hinchinbrook Boronia*.

*Selected specimens examined (of 10 collections):* QUEENSLAND; COOK DISTRICT: Hinchinbrook Is., near fresh water creek at the southern end of Missionary Bay, 18°19'S 146°13'E, A. and M. Thornsborne 535, 17.vi.1979 (BRI); Zoe Bay, Hinchinbrook Is., S.T. Blake 18857, 21.viii.1951 (BRI, CANB); Mt Diamantina, 18°26'S 146°18'E, R.J. Cumming 11273, 27.vii.1991 (BRI); Southern end of Missionary Bay, N end of Hinchinbrook Is., 18°27'S 146°12'E, S.L. Everist 7786, 27.ii.1965 (BRI, CANB, MELU, NSW); Mount Bowen, Hinchinbrook Is., 18°41'S 146°16'E, R.J. Cumming 11217, 30.vi.1991 (BRI).

*Notes:* *Boronia jenziae* can be distinguished from *B. excelsa*, *B. bella* and *B. foetida* by having a moderately hirsute on the adaxial surface of the petals (the petals of the other species are glabrous to glabrescent).

*Distribution and ecology:* *Boronia jenziae* is endemic to Hinchinbrook Island, Queensland (Fig. 13) in a variety of habitats, including *Syncarpia* or *Eucalyptus* open forest and montane heath, from sea level to the summit of Mt Bowen (c. 840 m). Unlike other species in *Boronia* sect. *Valvatae* this species can sometimes be found in dense communities dominated by sedges. Flowering: February–September; fruiting: August–September.

*Conservation status:* 2RC- (Duretto 1999).

**40. *Boronia excelsa*** Duretto, *Austrobaileya* 5: 284 (1999), fig. 11 G-L. *Type:* State Forest 144 Mt Windsor Tableland, 16°15'52"S 145°02'28"E, P.I. Forster 17248 and S.J. Figg, 11.vii.1995 (holotype BRI; isotypes AD, BRI (2 sheets), CANB, DNA, K, L, MEL 243038, MEL 249902, MEL 249903, MEL 2025931, MO, NSW, PERTH, QRS).

*Boronia* sp. (Mt Windsor Tableland P.I. Forster+ PIF15225) *sensu* Forster (1997, p. 185).

Erect, much branched *shrub* to 3 m tall. Multiangular stellate hairs with 8–12 rays; rays white to yellow, 0.05–0.1(–0.25) mm long. *Leaves* 14–60 mm long, 2–6 mm wide, sessile, narrowly elliptic, acute, attenuate, the margins plane to slightly recurved. *Inflorescence* 1-flowered; peduncle 0.5 mm long; prophylls minutely unifoliate, 1.5–2.5 mm long, 0.5–1 mm wide, with a dense, stellate indumentum, or as leaves; metaxyphylls 0.5–1 mm long; anthopodium 2–4 mm long. Sepals broadly ovate-deltate, c. 3 mm long, c. 1.5 mm wide. Petals 4.5–5 mm long, 2–3 mm wide; adaxial surface glabrous or glabrescent; abaxial surface with a moderately dense stellate indumentum. Filaments sparsely to moderately pilose; antesealous filaments c. 1.5 mm long, prominently glandular on the distal 0.5 mm; antepetalous filaments slightly tuberculate, c. 1 mm long; anther-apiculum absent. Style glabrous. *Cocci* c. 4.5 mm long, c. 2 mm wide, glabrous. Seed 3–3.5 mm long, c. 1.5 mm wide.

*Additional specimens examined:* QUEENSLAND; COOK DISTRICT: Spencers Ck, downstream about 2 km from Forestry Camp, Mt Windsor Tableland, Whypalla SF, 16°15'S 145°7'E, P. Hind 56791 and G. D'Aubert, 31.viii.1988 (NSW); State Forest 144, Mt Windsor Tableland, 16°15'52"S 145°02'28"E, P.I. Forster 17253 and S.J. Figg, 11.vii.1995 (BRI, MEL); SFR144 (Mt Windsor Tablelands), 16°15'S 145°00'E, B. Hyland 4784, 19.vi.1969 (BRI, QRS).

*Notes:* *Boronia excelsa* differs from *B. jenziae*, *B. foetida* and *B. bella* by its narrower (to 6 mm wide), sessile leaves, and smaller flowers.



*Distribution and ecology:* *Boronia excelsa* is restricted to the Mount Windsor Tableland, north-eastern Queensland (Fig. 13), where it is found growing on granite in wet sclerophyll and *Syncarpia* forests, and along rainforest edges above 1000 m.

*Conservation status:* 2R (Duretto 1999).

41. *Boronia foetida* Duretto, *Austrobaileya* 5: 285 (1999), fig. 11 M-R. *Type:* Mt Walsh, 7 km south of Biggenden, Grid Ref. 9347-046709, 25°34'S 152°03'E, *P.I. Forster* 7483, 28.ix.1990 (holotype MEL 1597019; isotypes AD 99135181, BRI AQ474340, CANB 406384, K *n.v.*, NSW, PERTH *n.v.*).

*Boronia* sp. (Mt Walsh *P.I. Forster*+ PIF17253) *sensu* Forster (1997, p. 185).

Erect, much branched *shrub* to 2 m. Multiangular stellate hairs with c. 8–20 rays; rays white to yellow, 0.05–0.1(–0.25) mm long. *Leaves* 20–52 mm long, 7–14 mm wide; petiole 2–7 mm long; lamina elliptic to slightly lanceolate, acute, attenuate. *Inflorescence* 1(–3)-flowered; peduncle 2–2.5 mm long; prophylls minutely unifoliate, 1–6 mm long, 0.5–2 mm wide, with a dense, stellate indumentum, or as leaves; metaxyphylls 0.5–1 mm long; anthopodium 7–13 mm long. Sepals 2–3.5 mm long, 1.5–2.5 mm wide, enlarging to 4 mm long and 3 mm wide as fruit matures. Petals c. 7 mm long, c. 4 mm wide, enlarging to 8 mm long as fruit matures. Filaments sparsely to moderately pilose; antesealous filaments c. 2 mm long, prominently glandular on the distal 0.5–1 mm; antepetalous filaments slightly tuberculate, c. 1.5 mm long; anther-apiculum large, reflexed. Style glabrous. *Cocci* 4–5 mm long, 2–3.5 mm wide, glabrous. Seeds c. 4 mm long, c. 2 mm wide.

*Selected specimens examined (of five collections):* QUEENSLAND; BURNETT DISTRICT: Gully just below saddle between Mt Walsh and The Bluff, Mt Walsh NP, 25°34'S 152°03'E, *M.F. Duretto* 261–265, *M. Bayly* and *N. Marsh*, 4.ix.1992 (*MFD261:* MEL; *MFD262:* MEL, NSW; *MFD263:* BRI, MEL; *MFD264:* HO, MEL; *MFD265:* CANB, MEL).

*Notes:* *Boronia foetida* was referred to as the Mt Walsh form of *B. rosmarinifolia* by Stanley and Ross (1983). It is closely related to *B. bella* from which it can be distinguished by the smaller flowers, smaller hairs, and glabrous styles.

*Distribution and ecology:* *Boronia foetida* is restricted to Mount Walsh N.P., south of Biggenden, Queensland (Fig. 13), where found in a variety of habitats ranging from montane heath to densely forested gullies. Flowering and fruiting: May–September.

*Conservation status:* 2RC- (Duretto 1999).

42. *Boronia bella* Duretto, *Austrobaileya* 5: 287 (1999), fig. 11 S-X. *Type:* Upper Oakly Ck, Many Peaks Range, Qld, c. 24°11.5'S 151°17.5'E, 9149-263238, *M. Duretto* 269, *M. Bayly* and *N. Marsh*, 5.ix.1992 (holotype MEL 2036441; isotypes AD, BRI, CANB (CBG 9604106), DNA, K, MEL 2036442, NSW, PERTH).

*Boronia* sp. *Telford* CBG 7702560 *sensu* Batianoff and Dillewaard (1988, p. 114).

*Boronia* sp. (Many Peaks Range *I.R. Telford* CBG 7702560) *sensu* Forster (1997, p. 185).

Erect, much branched *shrub* to 2 m. Multiangular stellate hairs with c. 10–20 rays; rays white to yellow, (0.1–)0.25–0.5 mm long. *Leaves* 18–35 mm long, 3.5–10 mm wide; petiole 2–4 mm long; lamina elliptic, acute, attenuate. *Inflorescence* 1(–3)-flowered; peduncle 0.5–2 mm long; prophylls minutely unifoliate, 2–5.5 mm long, 0.5–2.5 mm wide, with a dense, stellate indumentum, or as leaves; metaxyphylls 0.5–2.5 mm long; anthopodium 2–7 mm long. Sepals 4.5–5.5 mm long, 2–2.5 mm wide. Petals 7–8 mm

long, 4–5.5 mm wide, enlarging to 12 mm long as fruit matures. Filaments densely pilose; antesealous filaments c. 2.5 mm long, prominently glandular on the distal 0.5–1 mm; antepetalous filaments slightly tuberculate, c. 2 mm long; anther-apiculum large, erect or reflexed. Style hirsute. *Cocci* 4.5–6 mm long, 2.5–3.5 mm wide, glabrous or with few hairs along suture. Seeds 4–5 mm long, 2–2.5 mm wide.

*Additional specimens examined:* QUEENSLAND: BURNETT DISTRICT: Mt Castletower NP, eastern slopes of Many Peaks Range, 24°07'41"S 151°18'25"E, *P.I. Forster* 16338, 20.ii.1995 (BRI *n.v.*, MEL); Many Peaks Range, Mt Castletower, 24°10'S 151°17'E, *I.R. Telford* 5479 (BRI, CANB); Upper Oaky Ck, Many Peaks Range, c. 24°11.5'S 151°17.5'E, Calliope 9149-263238, *M.F. Duretto* 270-273, *M. Bayly* and *N. Marsh*, 5.ix.1992 (MFD270: BRI, CANB, MEL; MFD271: BRI, CANB, DNA, K, MEL, NSW; MFD272: BRI, MEL, NSW; MFD273: BRI, CANB, HO, MEL, NSW, PERTH); State Forest 521, Many Peaks Range, 24°12'42"S 151°20'31"E, *P.I. Forster* 16255, 17.ii.1995 (BRI *n.v.*, MEL); Many Peaks Range, *I. Olsen* 348 (NSW).

*Notes:* *Boronia bella* is closely related to *B. foetida* from which it differs by larger flowers and hairs, and hirsute styles.

*Distribution and ecology:* *Boronia bella* is restricted to the Many Peaks Range near Gladstone, Queensland (Fig. 13), where it is found in eucalypt forest and woodland on granitic soils. Flowering: May–September; fruiting: September.

*Conservation status:* 2RC- (Duretto 1999).

*Boronia* sect. *Valvatae* subsect. 4. *Grandisepalae* Duretto, subsect. nov. Sepala petalis longioribus vel subaequilibus. Antherae antipetalae antheris antiseptis largioribus. *Sp. typica:* *B. grandisepala* F. Muell.

Multiangular stellate hairs sessile, or stalked (series *Grandisepalae*); rays unfused, smooth, shiny and straight or rarely not smooth, flexuous and dull (subser. *Verecundae*), not appressed; simple hairs, when present on vegetative structures, 0.5–2 mm long,

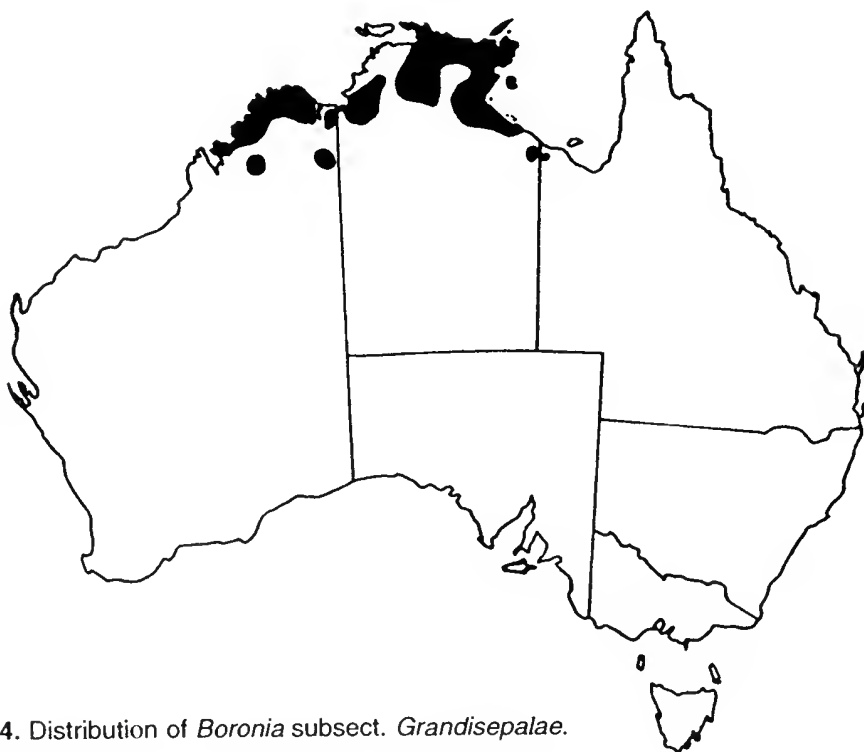
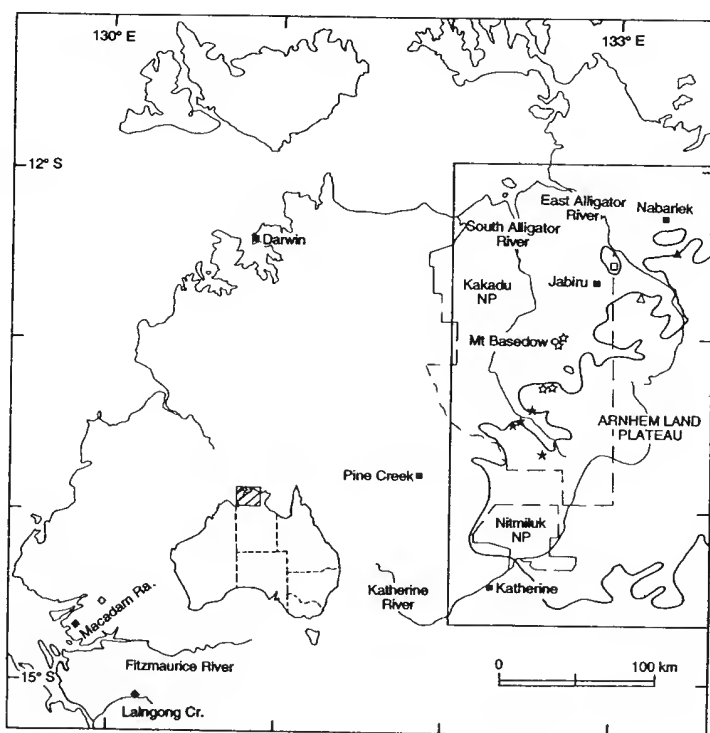


Fig. 14. Distribution of *Boronia* subsect. *Grandisepalae*.

antrorse. *Branches* terete to quadrangular, not obviously glandular (except *B. jucunda*), decurrent leaf bases absent (except *B. pauciflora*), hairs uniformly distributed (except *B. pauciflora*, *B. filicifolia*). *Leaves* simple or imparipinnate; rachis segments triangular, rarely elliptical; lamina dorsiventral or isobilateral, epicuticular wax platelets absent or present (ser. *Quadrilatae*); the midrib usually prominently raised on the abaxial surface and impressed on the adaxial surface, with tightly packed tissue between midvein and abaxial epidermis. *Inflorescence* 1(–3)-flowered. Sepals as large or larger than petals, similar to petals in colour and texture; adaxial surface with a moderately dense to dense minute indumentum. Petals without a raised midrib or the midrib slightly raised at the base of the abaxial surface, abaxial surface with an indumentum of firm, straight and glossy stellate hairs (except ser. *Quadrilatae*, *B. verecunda*). Filaments clavate, suddenly narrowing at apex so as to appear truncated before connecting to anther, pilose on the abaxial surface and the margins below the glandular tip; antepetalous filaments glandular at the distal end or not; anthers attached to the apex of the filament, antepetalous anthers much larger than antesepalous anthers; anther-apiculum absent or present. Disc entirely within stamen whorl, glabrous. *Seeds* (except *B. viridiflora*) elliptical with adaxial side flattened and with a prominent ridge, shiny, black, at magnification tuberculate; tubercles smooth, fused or unfused.



**Fig. 15.** Distribution of *Boronia* series *Quadrilatae*: *B. quadrilata* ( $\Delta$ ), *B. viridiflora* ( $\blacktriangle$ ); *Boronia* subseries *Verecundae*: *B. verecunda* ( $\star$ ), *B. xanthastrum* ( $\star$ ); *Boronia* subseries *Grandisepalae*: *B. suberosa* ( $\square$ ); approximate locality for where Mueller crossed the Macadam Range and collected the lectotype of *B. grandisepala* ( $\diamond$ ), western Northern Territory collections of *B. grandisepala* subsp. *grandisepala* ( $\blacklozenge$ ). See Fig. 16 for detail of western Arnhem Land. Adapted from Duretto and Ladiges (1997), fig. 1.

A subsection of at least 16 species divided into three series and five subseries that are found in the Kimberley Region of Western Australia, the 'Top End' of the Northern Territory and north-western Queensland (Figs 14–18). It is characterised by the large sepals relative to the petals, antepetalous anthers that are much larger than the antesealous anthers, and the clavate filaments.

*Boronia* sect. *Valvatae* subsect. 4 *Grandisepalae* ser. 1. *Quadrilatae* Duretto, ser. nov.  
 Planta glabra praeter petala et paginas adaxiales sepalorum. Rami purpurati, quadrangulati manifeste. Folia glauca. *Sp. typica*: *B. quadrilata* Duretto

Erect or horizontal (from cliff faces) *shrubs*, glabrous except for flowers. Stellate hairs sessile, with c. 3–25 rays; rays smooth, 20–50 µm long. Branches distinctly quadrangular in cross-section, purple, decurrent leaf bases present. *Leaves* simple, slightly discolourous, paler beneath, slightly fleshy, plane, isobilateral, glaucous with a dense layer of epicuticular wax platelets, wax platelets 0.1–0.5 µm across; the midrib impressed slightly on the adaxial surface and slightly raised on the abaxial surface, cells between midvein and abaxial epidermis with or without secondary thickening. *Prophylls* unifoliate. Sepals as large or larger than petals, acute to acuminate, abaxial surface glabrous, glaucous. Petal adaxial surface with a sparse indumentum. Antepetalous filaments glandular at the distal end or not; anther-apiculum absent. Style glabrous.

A series of two species found in the north-western portion of the Arnhem Land plateau, Northern Territory (Fig. 15). It is characterised by being glabrous (except for the flowers), having purple and quadrangular stems, and leaves that are glaucous, simple and isobilateral.

43. *Boronia quadrilata* Duretto, *Austral. Syst. Bot.* 10: 297 (1997), fig. 26. *Type*: N.T., Upper Magela Ck, 6 km N of Magela Falls, 12°45'S 133°08'E, *K. Brennan 1567*, 10.x.1991 (holotype DNA 60356 (photographs BRI, HO, MEL 2041201, NSW); isotypes CANB, MEL 242492, PERTH).

*Boronia* D60356 Magela *sensu* Leach *et al.* (1992, p. 35); Dunlop *et al.* (1995, p. 100).

*Boronia* sp.7 (Magela Creek; *K. Brennan 1567*) *sensu* Briggs and Leigh (1996, p. 167).

Erect *shrub* to 1.5 m. Multiangular stellate hairs present on petals only, with 4–25 rays per hair; rays 20–50 µm long. *Leaves* 23–55 mm long, 12–20 mm wide, sessile, glandular, elliptical, acute, aristate and slightly decurrent, epidermal wax platelets 0.1–0.5 µm across; the midrib raised on the abaxial surface, region between midvein and epidermis consisting of tightly packed cells with secondary thickening. *Peduncle* 2–2.5 mm long; *prophylls* 6–13 mm long, 3–7 mm wide; *metaxyphylls* 0.75 mm long; *anthopodium* 0.5–2 mm long. Sepals deltate, c. 6 mm long, c. 3 mm wide, enlarging to 9–10 mm long and 4.5–5.5 mm wide as fruit matures, longer and wider than petals; adaxial surface with a moderately dense stellate indumentum; abaxial surface glabrous and slightly glaucous. Petals c. 4 mm long, c. 2 mm wide, enlarging to 5 mm long as fruit matures; adaxial surface with a sparse stellate indumentum; abaxial surface with a moderately dense stellate indumentum. Antesealous filaments c. 1.5 mm long, the distal 0.4 mm prominently glandular; antepetalous filaments smooth to slightly glandular, c. 1 mm long; abaxial surface of anther slightly frosty, anther-apiculum absent, glabrous. *Cocci* c. 6 mm long, c. 3.5 mm wide, glabrous. Seed not seen.

*Specimen seen*: Known from the type material only.



*Notes:* *Boronia quadrilata* differs from *B. viridiflora* by being erect, and by elliptical leaves with acute tips and cuneate bases and larger flowers and fruit.

*Distribution and ecology:* *Boronia quadrilata* is known only from the catchment area of Magela Creek in the central area of the Arnhem Land plateau, Northern Territory (Fig. 15). At present this species is known from a single population of 10–15 plants on one ridge top next to *Allosyncarpia* S.T. Blake forest (K. Brennan, pers. comm.) Flowering and fruiting: October (1 collection).

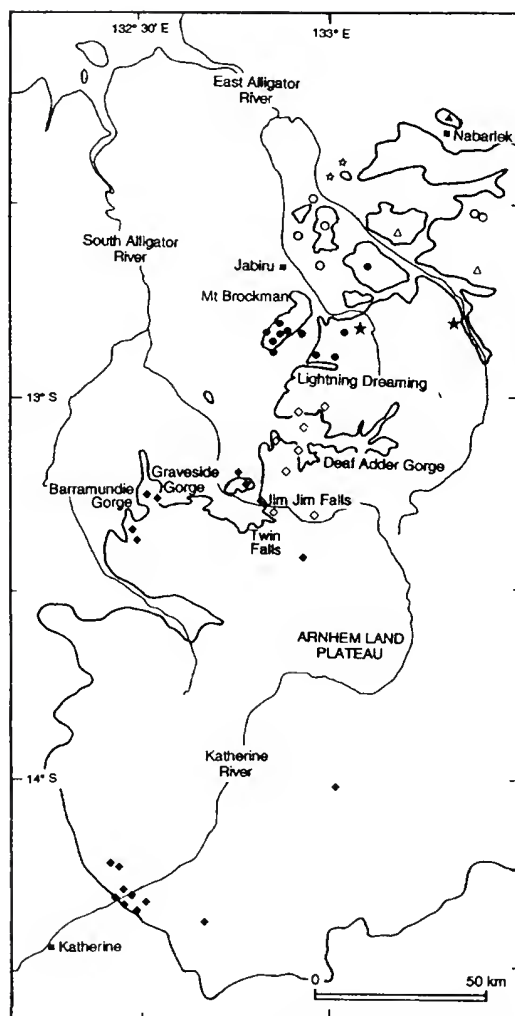
*Conservation Status:* This species was given a ROTAP code of 2R by Duretto and Ladiges (1997), but after discussions with K. Brennan (1997) indicated that the population was at risk from fire a ROTAP code of 2V or 2E is more appropriate. Further sampling of the known population (except perhaps for seed) should be discouraged and detailed surveys of the area are required to ascertain if any other populations exist.

- 44. *Boronia viridiflora*** Duretto, *Austral. Syst. Bot.* 10: 295 (1997), fig. 25. *Type:* c. 2 km S of Myra Falls, Arnhem Land, NT, 12°28'S 133°20'E, *M.F. Duretto 421*, *J. Chappill, G. Howell and K. Brennan*, 14.vi.1993 (holotype DNA (photographs MEL 2041202, NSW).

Horizontal shrub, growing perpendicular or slightly upwards from vertical rock faces, to 1.5(–2) m long. Multiangular stellate hairs present on petals only, with 3–8 rays per hair; rays 20–40 µm long. Branchlets distinctly quadrangular but becoming terete as the branch ages, slightly glandular. Leaves 8–40 mm long, 7–16 mm wide; petiole 0.5–3.5 mm long; lamina elliptic to oblanceolate, acute to obtuse, attenuate, epidermal wax platelets 0.1–0.2(–0.5) µm wide; the midrib ± impressed on the adaxial surface, ± slightly raised on the abaxial surface, with tightly packed cells without secondary thickening between midvein and abaxial epidermis. Inflorescence 1–3-flowered; peduncle (0–)0.5–3 mm long; prophylls 0.75–12 mm long, 1–3 mm wide; metaxyphylls 0.5 mm long; anthopodium 1.5–2 mm long. Sepals ovate to deltate, acute, green but sometimes top half or tip burgundy, 2.5–3 mm long, 1.5–2.5 mm wide, to 3.5–4 mm long as fruit matures, ± equal to petals but becoming larger as fruit matures; adaxial surface with densely and minutely pubescent near the margins, becoming glabrous towards base and the midrib. Petals 2.5–3 mm long, 1.5–2 mm wide, not enlarging significantly as fruit matures; adaxial surface sparsely simple pubescent mainly on the margins, large number of erect multicellular glands on the distal half; abaxial surface with a sparse stellate indumentum, mainly on the midrib. Antesepalous filaments c. 1.5 mm long, prominently glandular on the distal 0.5 mm; antepetalous filaments smooth, c. 1 mm long; abaxial surface of anther not frosty. Cocci 4.5–5 mm long, 2.5–3 mm wide, glabrous. Seeds grey, dull, 4–4.5 mm long, c. 2 mm wide, without a dorsal ridge; at magnification surface c. reticulate foveate, units appearing to be collapsed tubercles, individual units 24–76 µm across.

*Selected specimens examined (of 3 collections):* THE NORTHERN TERRITORY; DARWIN and GULF COUNTRY: c. 4.5 km S and 1.3 km W of Myra Falls, Arnhem Land, 12°29'S 133°21'E, *M.F. Duretto 430–434*, *J. Chappill, G. Howell and K. Brennan*, 14.vi.1993 (*MFD430*: MEL; *MFD431*: AD, K, MEL; *MFD432*: CANB, DNA, MEL, NSW, PERTH; *MFD433*: DNA, MEL; *MFD434*: AD, DNA, HO, MEL).

*Notes:* *Boronia viridiflora* differs from *B. quadrilata* by its horizontal habit, smaller, oblanceolate, subsessile leaves with obtuse tips and attenuate bases, and smaller flowers and fruits. The horizontal habit and glaucous, glabrous leaves distinguishes *B. viridiflora* from the two other boronias, *B. rupicola* (species 20 above) and *B. suberosa* (species 47 below), that grow on vertical rock faces in Arnhem Land. This horizontal habit (from vertical cliff faces) is unique in *Boronia* but is found in other species found in the north-western escarpment of the Arnhem Land plateau, e.g. *Phyllanthus cauticola* J.T. Hunter



**Fig. 16.** Western Arnhem Land plateau and surrounds. Distribution of *Boronia* subseries *Grandisepalae*: *B. grandisepala* subsp. *grandisepala* (◆), *B. grandisepala* subsp. *acanthophida* (◇), *B. laxa* (●), *B. aff. laxa* 1 (Δ), *B. aff. laxa* 2 (▲), *B. prolixa* (○), *B. aff. prolixa* (☆), *B. amplexens* (★). Adapted from Duretto and Ladiges (1997), fig. 2.

& J.J. Bruhl (Euphorbiaceae; Hunter and Bruhl 1997b).

**Distribution and ecology:** *Boronia viridiflora* is known from two populations south of Nabarlek, Arnhem Land, Northern Territory (Fig. 15), where it grows on vertical sandstone surfaces of cliffs or boulders on the plateau surface. Flowering and fruiting: material collected in April and June.

**Conservation status:** 2R (Duretto and Ladiges 1997).

***Boronia* sect. *Valvatae* subsect. *Grandisepalae* Duretto ser. 2. *Grandisepalae***

Erect or spreading shrubs, with a sparse to dense, stellate indumentum on the branches, leaves, inflorescence parts and abaxial surfaces of the perianth. Stellate hairs sessile or stalked; rays smooth or flexuous, 0.1–1 mm long. Branches terete to slightly quadrangular, brown, decurrent leaf bases absent. Leaves simple, lamina discolourous or

concolourous, not succulent, plane or margin slightly recurved, dorsiventral or isobilateral, epicuticular wax platelets absent, the midrib impressed on the adaxial surface, prominently raised on the abaxial surface, secondary thickening in cells between midvein and abaxial epidermis. Prophylls sometimes unifoliate. Sepals longer and wider than petals, acuminate. Antepetalous filaments glandular at the distal end; anther-apiculus absent or present. Style glabrous or hirsute. Seed tuberculae unfused or fused into longitudinal rows.

A series of two subseries and at least seven species that is endemic to the Northern Territory (Figs 15, 16). It is characterised by a sparse to dense indumentum, simple leaves, and shiny, black seeds.

***Boronia* sect. *Valvatae* subsect. *Grandisepalae* ser. *Grandisepalae* subser. 1. *Verecundae***

Duretto, subser. nov. Pili stellati stipitati. Gynecium glabrum et cocci glabri. Pagina seminibus tuberculata. *Sp. typica*: *B. verecunda* Duretto

Erect shrubs, with a sparse to moderately dense stellate indumentum on the branches, leaves, inflorescence parts and abaxial surface of the perianth. Stellate hairs always stalked, even on perianth, stalks 0.25–0.5(–1) mm long; rays 0.5–1 mm long. Leaves dorsiventral. Metaxephylls minute or absent. Sepal adaxial surface glabrous or with a sparse indumentum, abaxial surface with a sparse to moderately dense stellate indumentum. Petal adaxial surface glabrous or with a sparse indumentum; abaxial surface with a sparse to moderately dense stellate indumentum. Anther-apiculus absent or present. Style glabrous. Cocci glabrous. Seeds black, at magnification tuberculate or slightly striate.

A subseries of two species, endemic to Kakadu N.P., Northern Territory (Fig. 15), characterised by stalked hairs with long rays.

45. *Boronia verecunda* Duretto, *Austral. Syst. Bot.* 10: 291 (1997), figs 20e, f. *Type*: Kakadu N.P., 13°27'S 132°29'E, C.R. Dunlop 8611 and P.F. Munns, 22.iv.1990 (holotype DNA 47561 (photograph & transparency MEL 2041223); isotypes AD 99027035, BRI AQ511732, CANB 400809, MEL 1583457, NSW, PERTH *n.v.*).

*Boronia* D6347 Kakadu *sensu* Leach *et al.* (1992, p. 35); Dunlop *et al.* (1995, p. 100).

*Boronia* sp.9 (Kakadu; Martensz & Schodde 575) *sensu* Briggs and Leigh (1996, p. 167).

Erect, much branched subshrub to 40 cm tall. Multiangular stellate hairs with 9–15 rays per hair; rays white, 0.5–0.75(–1) mm long, weak, flexuous, dull. Branchlets slightly quadrangular but becoming terete as the branch ages, decurrent leaf bases absent or indistinct; new shoots with a moderately dense, light pink to white indumentum, older branches with a sparse to moderately dense stellate indumentum and becoming glabrous as they age. Leaves 13–27(–50 on younger plants) mm long, 2–4(–8) mm wide; petiole to 1 mm long; lamina narrowly elliptic, acute, attenuate to cuneate, plane or margin slightly recurved; adaxial surface with a sparse to moderately dense stellate indumentum; abaxial surface with a sparse indumentum, the hairs mainly on margin and the midrib. Inflorescence 1-flowered; peduncle 0.5–1 mm long, with a moderately dense to dense indumentum; prophylls 4–5 mm long, 0.5 mm wide, with a sparse to moderately dense stellate indumentum; anthopodium 1–1.5 mm long, glabrous or with a sparse to moderately dense stellate indumentum. Sepals white or pink, becoming green as fruit matures, ovate to deltate, acute to acuminate, 6–7 mm long, 1.5–3 mm wide, not

enlarging significantly as fruit matures; adaxial surface glabrous or with a sparse stellate indumentum; abaxial surface with a moderately dense stellate indumentum. Petals white or pink, becoming green as fruit matures, 3.5–4.5 mm long, 1.5–2.5 mm wide, not enlarging significantly as fruit matures, midvein slightly raised on the abaxial surface at base; adaxial surface glabrous; abaxial surface with a sparse stellate indumentum, mainly on the midrib. Antesepalous filaments c. 1.5 mm long, the distal 0.75–1 mm prominently glandular; antepetalous filaments glandular, c. 1 mm long; abaxial surface of anther slightly frosty, anther-apiculum minute. Cocci 4.5–5 mm long, 3.5–4 mm wide. Seeds 3.5–4.5 mm long, 1.5–2 mm wide; tubercles 10–32 µm across.

*Selected specimens examined (of five collections):* THE NORTHERN TERRITORY; DARWIN and GULF COUNTRY: Kakadu NP, UDP Falls, 13°25'S 132°24'E, A.V. Shee and L.A. Craven 3053, 30.iv.1990 (AD, BRI, CANB, MEL); UDP Mine area, 13°29'S 132°26'E, Dunlop and Byrnes 2121, 17.iii.1971 (CANB, PERTH, DNA); 2–3 miles N of El Sharana, 13°31'S 132°31'E, Martensz and Schodde AE575, 25.i.1973 (CANB, DNA); Kakadu NP, 18.5 km S of Gimbat HS, below eastern edge of Marawal Plateau, 13°44'S 132°36'E, A.V. Shee and L.A. Craven 2717, 21.iv.1990 (AD, CANB, MEL).

*Notes:* *Boronia verecunda* differs from *B. xanthastrum* by weak, white hairs, narrower leaves, larger flowers and petals that are glabrous on the adaxial surface.

*Distribution and ecology:* *Boronia verecunda* is restricted to Kakadu N.P., Northern Territory, in the sandstone escarpment country of the South Alligator River catchment area (Fig. 15). Flowering: January–April; fruiting material collected only in April.

*Conservation status:* 2RC- (Briggs and Leigh 1996).

46. *Boronia xanthastrum* Duretto, *Austral. Syst. Bot.* 10: 292 (1997), figs 20g, h. *Type:* 25 km WNW of Twin Falls, 13°16.5'S 132°35'E, L.A. Craven 6226, 1.vi.1980 (holotype CANB 313880 [photographs DNA, MEL 2041228]).

*Boronia* sp. 4 (Craven 6226) *sensu* Lazarides *et al.* (1988, p. 23).

Erect, much branched subshrub to 40 cm tall; with a sparse to moderately dense stellate indumentum on the branches, leaves and inflorescence parts. Multiangular stellate hairs with 5–10(–14) rays per hair; rays yellow, becoming white and flexuous as the hair ages, 0.5–1 mm long, firm, glossy, smooth. Branchlets slightly quadrangular but becoming terete, young branches with a dense, yellow indumentum and glabrous as they age. Leaves 10–36 mm long, 2.5–6.5 mm wide; petiole 0.5–1.5 mm long; lamina elliptic to lanceolate, acute, attenuate to cuneate. Inflorescence 1(–3)-flowered; peduncle 0.5–1 mm long; prophylls minutely unifoliate, 1.5–4 mm long, 0.5 mm wide; anthopodium 0.5–1.5 mm long. Sepals yellow-green, ovate to deltate, acuminate, 3.5–6 mm long, 1–2.5 mm wide, enlarging to 5–7 mm long as fruit matures; adaxial surface glabrous; abaxial surface with a sparse to moderately dense stellate indumentum. Petals yellow-green, 2.5–4 mm long, 1–1.5 mm wide, not enlarging significantly as fruit matures; adaxial surface with a sparse to moderately dense stellate indumentum, becoming glabrous towards base; abaxial surface with a sparse stellate indumentum mainly on the midrib and the distal portion. Antesepalous filaments 1.25–1.5 mm long, the distal 0.75 mm prominently glandular; antepetalous filaments slightly glandular, 0.75–1 mm long; abaxial surface of anther slightly frosty, anther-apiculum absent. Cocci 4–6 mm long, c. 2 mm wide. Seeds 4–4.5 mm long, c. 2 mm wide; tubercles 12–34 µm across.

*Selected specimens examined (of eight collections):* THE NORTHERN TERRITORY; DARWIN and GULF COUNTRY: Between Jim Jim Rd and Mt Basedow, Kakadu NP, c. 12°59'S 132°42'E, M.F. Duretto 538–540 and G. Howell, 30.vi.1993 (MEL); Half way up Mt Basedow, Kakadu NP, c. 12°59.5'S 132°41'E, M.F. Duretto 542–543 and G. Howell, 30.vi.1993 (MEL); Near summit of Mt Basedow, Kakadu NP, c. 12°59.5'S 132°41'E, M.F. Duretto 544–7 and G. Howell, 30.vi.1993



(MFD544: DNA, MEL; MFD545-547: MEL); Graveside Gorge, Kakadu, 13°17'S 132°33'E, J. Russell-Smith 2274 and D. Lucas, 3.v.1987 (DNA); saddle/ridge above side creek, just downstream and W of plunge pool, Barramundi Gorge, Kakadu NP, 13°19'S 132°26'E, M.F. Duretto 464-468, J. Chappill and G. Howell, 18.vi.1993 (MFD464: DNA, MEL; MFD465-467: MEL; MFD468: MEL, CANB).

*Notes:* *Boronia xanthastrum* differs from *B. verecunda* by its stiff white-yellow hairs, wider leaves, smaller flowers, and petals that are hirsute on the adaxial surface.

*Distribution and ecology:* *Boronia xanthastrum* is restricted to Kakadu N.P. (Northern Territory), on and around the Mt Basedow Range, and in the Barramundi and Graveside Gorge areas (Fig. 15). It is found growing on schists (Mt Basedow Range) and sandstones (escarpment country) in both heath and woodland communities. Flowering and fruiting: February-June.

*Conservation status:* 2RC- (Duretto and Ladiges 1997).

***Boronia* sect. *Valvatae* subsect. *Grandisepalae* Duretto ser. *Grandisepalae* subser. 2. *Grandisepalae***

Erect or spreading or pendulous shrubs, with a moderately dense to dense stellate indumentum on the branches, leaves, inflorescence parts and the abaxial surface of the perianth. Stellate hairs usually sessile, occasionally stalked; rays white to faintly yellow, to 0.5 mm long, firm, straight, glossy, smooth. Leaves isobilateral. Metaxephylls absent or to 1 mm long. Sepal adaxial surface with a dense and minute simple/stellate-pubesence near the margins. Petal adaxial surface with a sparse to moderately dense indumentum. Anther-apiculum absent or minute. Style glabrous or hirsute. Cocci hirsute. Seeds striate, longitudinal ridges 12–52 µm apart and constructed of fused tubercles.

A subseries of five, possibly eight, species of the Northern Territory (Figs 16, 17), characterised by the usually sessile stellate hairs with rays to 0.5 mm long, and seed with a striate surface. These striations on the seed surface occur when the cellular projections on the seed surface, whether tubercles or collicles, fuse to form ridges (Duretto and Ladiges 1997). The structure of these ridges is similar to that of *Neobyrsesia suberosa* J.A. Armstr. (cf. Armstrong and Powell 1980, fig. 5), also found on the north-eastern Arnhem Land Plateau, and *Geleznovia verrucosa* Turcz. (unpublish. data) of south-western Australia.

*Boronia* subser. *Grandisepalae*, except *B. suberosa* and *B. amplexens*, was subjected to a phenetic analysis by Duretto and Ladiges (1997). This analysis identified, apart from a number of undescribed taxa, several specimens that could not be placed with confidence in any of the formally recognised taxa (see *B. aff. laxa* 1, *B. aff. laxa* 2, and *B. aff. prolaxa*, species 50, 51 and 53 below). Further collections on the Arnhem Land Plateau (Northern Territory) and research are required to resolve the taxonomy of this group.

- 47. *Boronia suberosa*** Duretto, *Austral. Syst. Bot.* 10: 288 (1997), fig. 22. *Type:* 11.5 km NE of Jabiru East, 12°35'S 132°58'E, L.A. Craven 5947, 26.v.1980 (holotype CANB 313890; isotypes A, CANB 313889, DNA 19572 [photographs HO, MEL 2041229, NSW], L, MEL 234382).

*Boronia* sp. 1 (*Lazarides 9004*) *sensu* Lazarides *et al.* (1988, p. 23).

*Boronia* D6852 Jabiru *sensu* Leach *et al.* (1992, p. 35); Dunlop *et al.* (1995, p. 100).

*Boronia* sp.8 (Jabiru; C.R. Dunlop 3305) *sensu* Briggs and Leigh (1996, p. 167).

Sprawling or pendulous, much branched subshrub to 50 cm long. Multiangular stellate hairs with (2–)7–14 rays per hair; rays clear to yellow, to 0.1(–0.3) mm long. Branchlets brittle, terete to slightly quadrangular, with a moderately dense to dense stellate indumentum and becoming glabrous with age, with massively developed cork on the older stems. Leaves 7–20 mm long, 3–11 mm wide; petiole absent or to 3 mm long; lamina elliptic to lanceolate, acute, attenuate, often appearing glabrous (to the unaided eye) but with a minute sparse to moderately dense stellate indumentum. Inflorescence 1-flowered, with a moderately dense to dense stellate indumentum; peduncle absent or to 1 mm long; prophylls 2–2.5 mm long, 0.5 mm wide; metaxyphylls 0.5–1 mm long; anthopodium 0.5–1 mm long. Sepals ovate to deltate, 3–5 mm long, 2–2.5 mm wide, enlarging to 6.5–7.5 mm long and 3–3.5 mm wide as fruit matures; adaxial surface with a sparse stellate indumentum; abaxial surface with a dense, stellate indumentum. Petals 2.5–3 mm long, 1.5–2 mm wide, enlarging to 4–5.5 mm long as fruit matures; adaxial surface with a sparse simple indumentum; abaxial surface with a sparse stellate indumentum. Antesepalous filaments 1.5–1.75 mm long, prominently glandular on the distal 0.5–1 mm; antepetalous filaments slightly glandular, c. 1 mm long; abaxial surface of anther not frosty, anther-apiculum absent, glabrous. Style glabrous. Cocci 3.5–5 mm long, 2–2.5 mm wide, with a sparse to moderately dense simple and stellate indumentum. Seeds 2.5–3.5 mm long, 1.5–2 mm wide; tubercles clearly visible at magnification.

*Additional specimens examined:* THE NORTHERN TERRITORY; DARWIN and GULF COUNTRY: 11.5 km NE of Jabiru East, 12°35'S 132°58'E, *M. Lazarides* 9004, 26.v.1980 (CANB, DNA); c. 8 km NNE of Jabiru East, 12°35'S 132°59'E, *J.L. Egan* 4843, 27.iv.1995 (DNA, MEL); ESE of Mudginberry, 12°36'S 132°58'E, *C. Dunlop* 3305, 19.ii.1973 (BRI, CANB, DNA, MEL, NSW, PERTH).

*Notes:* The older stems with massively developed cork is the diagnostic feature of this species.

*Distribution and ecology:* *Boronia suberosa* is known only from the southern end of the Ja Ja massive, Northern Territory (Fig. 15), where it is found on both sandstone pavements and cliff faces (collectors' notes). Flowering: February–April; fruiting: March–April.

*Conservation status:* 2RC- (Duretto and Ladiges 1997).

- 48. *Boronia grandisepala* F. Muell., *Fragm.* 1: 66 (1859).** *Type:* McAdam Ranges near Fitzmaurice River [Macadam Ra., c. 14°32'S 129°57'E, Northern Territory], *F. von Mueller*, Oct. 1855 (lectotype (Duretto and Ladiges 1997): K n.v. (cibachrome MEL 2041208; photographs of cibachrome DNA, NSW; photograph AD 99537203); isoelectotype MEL 727325).

Erect shrub to 1.5 cm tall and wide, with a moderately dense to dense stellate indumentum on the branches and leaves. Stellate hairs sessile, rarely stalked, with c. 10–20 rays; rays 0.1–0.3(–0.5) mm long. Leaves 7–55(–62) mm long, 1.5–14.5 mm wide; petiole 0.5–5 mm long; lamina narrowly elliptic to elliptic, sometimes sublanccolate, acute, ± slightly mucronate, attenuate to cuneate; juvenile leaves larger than adult leaves and with a sparse to moderately dense stellate indumentum that increases in density with each node until as adult leaves. Inflorescence 1(–3)-flowered, with a dense, stellate indumentum; peduncle absent or to 2.5(–7) mm long; prophylls linear, minutely unifoliate, 0.5–6 mm long, 1–2 mm wide; metaxyphylls to 0.5 mm long or sometimes absent; anthopodium 0.5–3(–4–5) mm long. Sepals white, pink or burgundy, broad-ovate, acuminate, (4–6)–7–10 mm long, 2–5.5 mm wide, enlarging to (6)–9.5–13 mm long and 5–7.5 mm wide as fruit matures; adaxial surface with a dense and minute simple and stellate indumentum near the margins, becoming glabrous towards base; abaxial surface

with a dense, stellate indumentum. Petals white, pink or burgundy, (3–)4–6 mm long, 1.5–3 mm wide, enlarging to (4–)5–7.5 mm long as fruit matures, midvein slightly raised at the base of the abaxial surface; adaxial surface with a moderately dense simple or stellate indumentum, sometimes becoming glabrous towards base; abaxial surface with a moderately dense to dense stellate indumentum. Antesepalous filaments 2–2.5 mm long, prominently glandular on the distal 0.5–1 mm; antepetalous filaments slightly glandular distally, 1–1.5 mm long; abaxial surface of anther sometimes slightly frosty, anther-apiculus absent or minute. Style hirsute at base or for full length, rarely glabrous. Cocci 4–5.5 mm long, 1.5–2.5 mm wide, with a moderately dense to dense simple and stellate indumentum. Seeds 3–4 mm long and 1.5–2 mm wide; surface ridges 27–44  $\mu\text{m}$  apart; ridge units sometimes unclear.

*Notes:* *Boronia grandisepala* can be distinguished from the other members of the series by its moderately dense to dense stellate indumentum throughout and larger flowers. Thin-walled vesiculose sclereids have been reported for this species (Rao and Bhattacharya 1978, 1981).

*Distribution:* This species occurs from Deaf Adder Gorge to just south of Katherine (Arnhem Land plateau), and disjunctly in the Macadam and Yambarran Ranges to the east, Northern Territory (Figs 15, 16).

#### *Key to subspecies*

1. Leaves of adult plants grey, with a dense indumentum, epidermis not visible, 25–40 hairs per  $\text{mm}^2$ , greater than 18 rays per hair on average ..... **48a. subsp. *grandisepala***
1. Leaves of adult plants not grey, with a moderately dense indumentum, epidermis visible at magnification, 7–18 hairs per  $\text{mm}^2$ , less than 17 rays per hair on average ..... **48b. subsp. *acanthophida***

#### **48a. *Boronia grandisepala* F. Muell. subsp. *grandisepala***

*Illustrations:* J. Brock, *Top End Native Plants*, 99 (1988, as *B. grandisepala*); J. Brock, *Native Plants of Northern Australia*, 99 (1993, as *B. grandisepala*).

Erect shrub to 1 m high and wide, adult plants with a dense, stellate indumentum on the branches and leaves. Leaves 7–45(–62 with juvenile leaves) mm long, 1.5–10 mm wide, epidermis not visible, c. 25–40 hairs per  $\text{mm}^2$ , c. 18–20 rays per hair on average. Peduncle absent or to 1.5(–5–7) mm long; prophylls 1–2(–4.5–6) mm long; anthopodium 0.5–2.5(–5) mm long. Sepals (4–)7–10 mm long, (2–)3–5 mm wide, enlarging to (6–)9.5–12 mm long and 5–6 mm wide as fruit matures. Petals (3–)4–6 mm long, (1.5–)2.5–3 mm wide, enlarging to 4–7.5 mm long as fruit matures.

*Selected specimens examined (of c. 35 collections):* THE NORTHERN TERRITORY; DARWIN and GULF COUNTRY: Upper Deaf Adder Ck, 13°03'S 132°52'E, *I. Olsen* 2685, 2.vi.1976 (MELU, NSW); 10 km N of Twin Falls, 13°13.5'S 132°47'E, 5471–597373, *M. Lazarides* 9050, 28.v.1980 (CANB, DNA, MEL); Graveside Gorge, Kakadu, 13°17'S 132°33'E, *J. Russell-Smith* 2279 and *D. Lucas*, 3.v.1987 (DNA); Tributary of Barramundi Ck, Kakadu NP, S of Pine Creek Rd, 13°21'S 132°26'E, *H.S. Thompson* 516, 30.vi.1983 (CANB, NSW, PERTH); 20 km SE of Twin Falls, 13°27'S 132°54'E, 5471–725123, *L.A. Craven* 5882, 24.v.1980 (BRI, CANB, DNA, MEL, NSW); Birdie Ck, Kakadu NP, 13°57'S 132°53'E, *G.J. Leach* 2728 and *I.D. Cowie*, 18.iv.1990 (BRI, DNA, MEL, PERTH); On track to and near Biddlecombe Cascades, Nitmiluk NP, 14°15.37'S 132°25.84'E, *M.F. Duretto* 527–531, *J. Chappill* and *G. Howell*, 28.vi.1993 (MFD527: MEL, NSW; MFD528–531: MEL); Katherine Gorge NP, in gorge at first rapids, 14°19'S 132°28'E, *P.A. Fryxell* and *L.A. Craven* 4223, 20.v.1983 (AD, DNA); 70 km E of Port Keates, 14°20'S 130°10'54"E, *P.K. Latz* 13773, 10.v.1994 (MEL); VICTORIA RIVER DISTRICT: Macadam Ra.,

14°41'S 129°44'E, *J. Russell-Smith* 7478 and *Lucas*, 2.iii.1989 (DNA [transparency & photograph MEL]); Headwaters of Lalngong Ck, 15°05'S 130°10'E, *I. Cowie* 5052 and *N.G. Walsh*, 16.v.1994 (CANB, MEL).

*Notes:* Duretto and Ladiges (1997) noted that plants from the southern end of the Arnhem Land Plateau have slightly smaller inflorescences and floral parts than those from the Macadam Range/Lalngong Ck area; and that specimens from Nitmiluk N.P. have narrower leaves and sometimes much smaller flowers than other specimens.

*Distribution and ecology:* *Boronia grandisepala* subsp. *grandisepala* is found from the rocky outlier just north of Jim Jim Falls south to Nitmiluk N.P. (Fig. 16), and disjunctly at the headwaters of Deaf Adder Gorge, and in the Macadam Range and Lalngong Ck areas (Fig. 15). It is found in heath and woodland communities on rock pavements, outcrops, and deep sand. Flowering and fruiting: December-June.

*Conservation status:* Widespread, found in Nitmiluk N.P. and Kakadu N.P., and not under threat.

**48b. *Boronia grandisepala* subsp. *acanthophida*** Duretto, *Austral. Syst. Bot.* 10: 278 (1997). *Type:* 11 miles SW of Mt Gilruth, 13°04'S 132°56'E, *M. Lazarides* 8007, 4.iii.1973 (holotype CANB 267569 (photographs HO, MEL 2041230); isotypes BRI AQ2244725, DNA 52722 (transparency MEL 2041225), NSW 244415).

Erect shrub to 1.5 m tall, with moderately dense indumentum on the branches and leaves. Leaves 8–55 mm long, 1.5–14.5 mm wide, epidermis visible, 7–18 hairs per mm<sup>2</sup>, (4–)8–17 rays per hair on average. Peduncle 0.5–2.5 mm long; prophylls 0.5–2 mm long; anthopodium 1–3 mm long. Sepals (5.5–)7.5–9.5 mm long, 2.5–5.5 mm wide, enlarging to 9.5–13 mm long and 5–7.5 mm wide as fruit matures. Petals 4–4.5 mm long, 2–2.5 mm wide, enlarging to 5–6 mm long as fruit matures.

*Selected specimens examined (of 12 collections):* THE NORTHERN TERRITORY; DARWIN and GULF COUNTRY: Top of sandstone above creek flowing N at Deaf Adder Gorge, c. 10 km from mouth, 13°07'S 132°56'E, *D.J. McGillivray* 3935 and *C.R. Dunlop*, 18.viii.1978 (DNA, MEL, NSW); Near Mt Gilruth, 13°10'S 133°06'E, *L.A. Craven* and *G.M. Wightman* 8307, 28.iii.1984 (CANB); 10 km N of Jim Jim Falls, 13°11'S 132°50'E, 5471-650419, *L.A. Craven* 6076, 29.v.1980 (DNA, MEL, CANB); c. 17 miles N of Mt Evelyn, 13°21'S 132°54'E, *M. Lazarides* 7993, 3.iii.1973 (CANB, DNA, MEL, NSW, PERTH); Top of Jim Jim Falls, Kakadu NP, 13°16.43'S 132°50.43'E, *M.F. Duretto* 459, *J. Chappill* and *G. Howell*, 17.vi.1993 (CANB, DNA, MEL).

*Distribution and ecology:* *Boronia grandisepala* subsp. *acanthophida* occurs on the Arnhem Land Plateau surface between Deaf Adder Gorge and Jim Jim Falls, Northern Territory (Fig. 16), where found in sandstone heath and woodland communities. Flowering: January-June; fruits: February-June.

*Conservation status:* 2RC- (Duretto and Ladiges 1997).

**49. *Boronia laxa*** Duretto, *Austral. Syst. Bot.* 10: 279 (1997), figs 20a, b. *Type:* Site FF, c. 30 km SE of Jabiru, 12°55'S 132°58.5'E, 5472-801711, *L.A. Craven* 6600, 30.iii.1981 (holotype CANB 338123; isotypes AD, DNA 20968 (transparency MEL 2041245), MEL 234407, P, US).

*Boronia grandisepala* (Craven 2423) *sensu* Lazarides *et al.* (1988, p. 23) *non* F. Muell.

*Boronia* sp. 3 (Craven 5715) *sensu* Lazarides *et al.* (1988, p. 23).

Semi-prostrate much branched shrub to 1.5 m long, with a sparse to moderately dense



stellate indumentum on the branches, leaves and inflorescence parts. Multiangular stellate hairs sessile (rarely stalked), 5–15 rays; rays yellow-white, 0.1–0.5 mm long. Leaves 10–45 mm long, 2.5–10 mm wide; petiole 0.5–3 mm long; lamina elliptic to sublanceolate, acute, attenuate to cuneate, plane. Peduncle 0.5–2.5 mm long; prophylls 0.5–2.5 mm long, 0.5 mm wide, sometimes minutely unifoliate; metaxyphylls to 0.5 mm long, sometimes absent; anthopodium 0.5–2 mm long. Sepals white to mauve, lanceolate-ovate, acuminate, 4–6 mm long, 2–3 mm wide, enlarging to 7–8 mm long and 3–5 mm wide as fruit matures; adaxial surface with a dense and minute indumentum near the margins, becoming glabrous towards base and the midrib; abaxial surface with a moderately dense stellate indumentum. Petals white to mauve, 2.5–4.5 mm long, 1–2 mm wide, enlarging to 4–5 mm long as fruit matures, midvein raised slightly at the base of the abaxial surface; adaxial surface sparsely simple and stellate indumentum sometimes becoming glabrous towards centre and base; abaxial surface with a moderately dense to dense stellate indumentum. Antesepalous filaments 1.5–1.75 mm long, prominently glandular on the distal 0.5 mm; antepetalous filaments smooth to prominently glandular distally, c. 1 mm long; abaxial surface of anther slightly frothy, anther-apiculum absent or minute. Style glabrous or hirsute at base to full length. Cocci 4–5.5 mm long, 2–2.5 mm wide, moderately simple and stellate indumentum. Seeds c. 4 mm long, c. 2 mm wide; longitudinal ridges 12–52  $\mu$ m apart; ridge units, 9–41  $\mu$ m across, sometimes unclear.

*Selected specimens examined (of 16 collections):* THE NORTHERN TERRITORY; DARWIN and GULF COUNTRY: Upper East Alligator R., Arnhem Land, 12°36'S 133°08'E, *J. Russell-Smith* 5365 and *Lucas*, 26.iv.1988 (DNA); Sandstone plateau, Kakadu, c. 12°50'S 133°05'E, *L.A. Craven* 2423, 27.ii.1973 (CANB, DNA); 2.5 km NW of Koongarra Saddle, Kakadu NP, 12°45'S 132°55'E, *I.R. Telford* 8112 and *J.W. Wrigley*, 24.iv.1988 (CANB, CANB, DNA, NSW); Koongarra area, 12°48'S 132°57'E, *C. Dunlop* 4860, 1.vi.1978 (CANB, DNA); Kakadu NP, Kuburra, NE of Nourlangie Rock, 12°50'S 132°51'E, *A.A. Muir* 5721, 17.v.1986 (AD, DNA, MEL); Just before Koongarra saddle, on track to mine site, Kakadu NP, 12°50.61 S 132°51.29'E, *M.F. Duretto* 445, *J. Chappill* and *G. Howell*, 16.vi.1993 (MEL); Lightning Dreaming, Arnhem Land, 12°55'S 133°02'E, *C. Dunlop* 6585 and *G. Wightman*, 22.ii.1984, (CANB, DNA, NSW).

*Notes:* *Boronia laxa* differs from *B. proluxa* and *B. amplexans* by its elliptical leaves and short peduncle (< 3 mm), from *B. aff. laxa* 2 by the moderately dense indumentum, and from *B. aff. laxa* 1 and *B. grandisepala* by the lax habit and smaller flowers.

*Distribution and ecology:* *Boronia laxa* is restricted to the Mt Brockman outlier (Kakadu N.P.) and nearby Arnhem Land Plateau surface, Northern Territory (Fig. 16). It is a component of sandstone heath and woodland communities. Flowering and fruiting: February–June.

*Conservation status:* 2VC- (Duretto and Ladiges 1997).

**50. *Boronia* aff. *laxa* 1** (Northern Plateau, Arnhem Land, Duretto and Ladiges 1997, 282).

Erect shrub to 1.5 m tall, with a moderately dense stellate indumentum on the branches and leaves. Multiangular stellate hairs with 3–15 rays; rays to 0.25 mm long. Leaves 10–58 mm long, 3–13 mm wide; petiole 1–5 mm long; lamina elliptic. Inflorescence 1(–3)-flowered, with a moderately dense to dense stellate indumentum; peduncle 0.5–4 mm long; prophylls 0.5–3.5 mm long, to 0.5 mm wide; metaxyphylls 0.5–2 mm long; anthopodium 1–6 mm long. Sepals deltate, white, 6.5–8 mm long and 3–5.5 mm wide enlarging to 11 mm long and 6 mm wide as fruit matures. Petals c. 3.5 mm long, c. 1.5 mm wide, enlarging to 5 mm long as fruit matures. Antesepalous filaments 1.75–2 mm long with the distal 0.75–1 mm being prominently glandular; antepetalous anther c. 1 mm

long; anther-apiculum absent. Style glabrous. Cocci 5–6.5 mm long, 2–2.5 mm wide, with a moderately dense indumentum. Seed not seen.

*Specimens examined:* THE NORTHERN TERRITORY; DARWIN and GULF COUNTRY: SE of Mt Howslip, West Arnhem Land, 12°34'S 133°10'E, *K.A. Menkorst* 983, 26.viii.1990 (DNA, MEL); Upper East Alligator R., Arnhem Land, 12°39'S 133°23'E, *J. Russell-Smith* 8446 and *Brock*, 20.ii.1991 (DNA, MEL).

*Notes:* *Boronia* aff. *laxa* 1 differs from typical *B. laxa* by its erect habit and the slightly larger inflorescence and floral parts, and from *B. grandisepala* subsp. *acanthophida* by the moderately dense indumentum and smaller floral parts.

*Distribution and ecology:* *Boronia* aff. *laxa* 1 is known from the northern part of the Arnhem Land plateau east of the East Alligator River gorge, Northern Territory (Fig. 16). Flowering material has been collected in February and August.

**51. *Boronia* aff. *laxa* 2** (Nabarlek, Arnhem Land, Duretto and Ladiges 1997, 282).

Semi-prostrate shrub. Multiangular stellate hairs with c. 6–25 rays; rays 0.1–0.2 mm long. Branches with a moderately dense stellate indumentum. Leaves with petiole 0.5–1.5 mm long; lamina narrowly elliptic, 10–35 mm long, 1.5–3.5 mm wide; adaxial surface with a moderately dense, stellate indumentum; abaxial surface with a dense, stellate indumentum. Inflorescence 1-flowered, with a dense, stellate indumentum; peduncle 0.5 mm long; prophylls c. 2 mm long, 0.5 mm wide; metaxephylls minute to 1 mm wide; anthopodium c. 1.5 mm long. Sepals white, 3.5–4 mm long, c. 2 mm wide, enlarging to 6 mm long and 3.5 mm wide as fruit matures. Petals white, 3–3.5 mm long and 1–1.5 mm wide, enlarging to 4.5–5 mm long as fruit matures. Antesepalous filaments c. 1.5 mm long, the distal 0.75 mm glandular; antepetalous filaments c. 1 mm long; anther-apiculum absent. Style glabrous. Cocci c. 4 mm long, c. 2 mm wide, with a moderately dense indumentum. Seeds c. 3 mm long, c. 1.5 mm wide.

*Specimen examined:* THE NORTHERN TERRITORY; DARWIN and GULF COUNTRY: Nabarlek, Arnhem Land, 12°19'S 133°19'E, *Hinz* 467, 23.iii.1989 (CANB, DNA [transparency MEL 2041227]).

*Notes:* *Boronia* aff. *laxa* 2 differs from typical *B. laxa* by its smaller, narrower leaves with a dense indumentum on the abaxial surface (as in *B. grandisepala* subsp. *grandisepala*) but a moderately dense indumentum on the adaxial surface, and by its smaller hairs, inflorescence and floral parts.

*Distribution and ecology:* *Boronia* aff. *laxa* 2 is known only from near Nabarlek, Northern Territory (Fig. 16). Flowering and fruiting material was collected in March.

**52. *Boronia prolixa*** Duretto, *Austral. Syst. Bot.* 10: 283 (1997), figs 20e, d. *Type:* 15 km NNE of Jabiru East, 12°32'S 132°57'E, *L.A. Craven* 6486, 7.vi.1980 (holotype CANB 313887 (transparency & photograph MEL 2041224); isotypes A, AD, CANB 313888, DNA 19571, MEL 234380).

*Boronia* sp. 2 (*Craven* 5957) *sensu* Lazarides *et al.* (1988, p. 23).

Semi-prostrate, much branched subshrub to 50 cm long, with a moderately dense stellate indumentum on the branches, leaves and inflorescence parts. Multiangular stellate hairs with 5–10(–17) rays per hair; rays 0.1–0.5 mm long. Branches terete. Leaves sessile or petiolate; petiole absent or to 2(–4.5) mm long; lamina 4.5–32(–45) mm long, 2.5–16 mm wide, lanceolate to strongly ovate, acute, euneate-truncate; adaxial surface of juvenile leaves with a sparse indumentum of appressed, straight, glossy, simple hairs that are

0.5–2 mm long. Inflorescence 1-flowered; peduncle 6–21 mm long; prophylls sometimes minutely unifoliate, (0.5–)1–1.5 mm long, to 0.5 mm wide; metaxyphylls minute to 0.5 mm long; anthopodium 1–5 mm long. Sepals white to pink, ovate to deltate, acute to acuminate, 4–6 mm long, 1.5–3 mm wide, enlarging to 5.5–7 mm long as fruit matures; adaxial surface with a sparse and minute indumentum along the margins, becoming glabrous towards centre and base; abaxial surface with a moderately dense stellate indumentum. Petals white to pink, 3–3.5 mm long, 1–1.5 mm wide, enlarging to 4–5 mm long and 2.5–3 mm wide as fruit matures; adaxial surface with a sparse stellate indumentum becoming glabrous towards base; abaxial surface with a sparse to moderately dense stellate indumentum. Antesepalous filaments 1.5–1.75 mm long, prominently glandular on the distal 0.5 mm; antepetalous filaments slightly glandular, c. 1 mm long; abaxial surface of anther not frosty, anther-apiculum absent or minute. Style hirsute at base. Cocci 4–5 mm long, c. 2 mm wide, with a moderately dense simple and stellate indumentum. Mature seed not seen.

*Selected Specimens examined (of nine collections):* THE NORTHERN TERRITORY; DARWIN and GULF COUNTRY: East Alligator R., Arnhem Land, 12°29'S 133°03'E, *C. Dunlop* 3234, 15.ii.1973 (DNA, NSW); near 3 Pools, Kakadu NP, 12°29'S 132°54'E, *J. Russell-Smith* 976, 15.i.1984 (DNA); Nabarlek, escarpment country, 12°30'S 133°21'E, *M. Lazarides* 9235, 7.vi.1980 (A, CANB, DNA, L, MEL); 14.5 km NE of Jabiru East, 12°32'S 132°57'E, *L.A. Craven* 5957, 26.v.1980 (CANB, DNA, MEL); Ibangu Ck, SE of Ja Ja Massive, 12°33'S 132°55'E, *J. Russell-Smith* 1120, 9.ii.1984 (DNA); 5 km E of Winwuyerr Ck Crossing, Kakadu NP, 12°34'S 132°57'E, *J. Russell-Smith* 1098, 6.ii.1984 (DNA).

*Notes:* *Boronia prolixa* differs from *B. laxa* by having a relatively long peduncle (> 6 mm long) and elliptical to ovate leaves; from *B. aff. prolixa* by its smaller leaves; from *B. amplexans* by having non-appressed hairs, a moderately dense indumentum throughout, and wider leaves; and from *B. grandisepala* by its lax habit and moderately dense indumentum throughout.

*Distribution and ecology:* *Boronia prolixa* is restricted to the north-western portion of the Arnhem Land plateau, Northern Territory (Fig. 16). A component of sandstone heath and woodland communities. Flowering and fruiting: January–June.

*Conservation status:* 2RC- (Duretto and Ladiges 1997).

**53. *Boronia* aff. *prolixa*** (Red Lily Lagoon, Arnhem Land, Duretto and Ladiges 1997, 285).

Sprawling shrub to 50 cm wide, with a sparse to moderately dense stellate indumentum on the branches, leaves and inflorescence parts. Multiangular stellate hairs with 6–12 rays, rays 0.1–0.5 mm long. Leaves with a petiole 1.5–3 mm long; lamina 11–50 mm long, 4–15 mm wide, elliptical to ovate, tip acute. Inflorescence 1-flowered; peduncles 3.5–6(–11) mm long; prophylls c. 2 mm long; metaxyphylls minute; anthopodium 1–2 mm long. Sepals 3.5–5 mm long, 1.5–3 mm wide, enlarging to 6.5–7 mm long and 4.5 mm wide as fruit matures. Petals 2–2.5 mm long, c. 1 mm wide, enlarging to 4 mm long as fruit matures. Antesepalous filaments 1.5–1.75 mm long, prominently glandular on the distal 0.5 mm; antepetalous filaments slightly glandular, c. 1 mm long; abaxial surface of anther not frosty, anther-apiculum minute. Style hirsute. Mature fruit and seed not seen.

*Specimens examined:* THE NORTHERN TERRITORY; DARWIN and GULF COUNTRY: 9 km NE of East Alligator R. on Oenpelli Rd, 12°23'S 133°01'E, *S. Jacobs* 1853, 3.vi.1974 (CANB, DNA, NSW, PERTH); Red Lily Lagoon area between Cahills crossing and Oenpelli, 12°24'S 133°++'E, *T.G. Hartley* 13722, 23.iii.1973 (CANB, DNA).

*Notes:* *Boronia* aff. *prolixa* may be an undescribed species; it differs from *B. prolixa* by its larger leaves, shorter peduncles, wider sepals and smaller petals.

*Distribution and ecology:* *Boronia* aff. *prolixa* is known from the Red Lily Lagoon area, south and west of Oenpelli, Arnhem Land, Northern Territory (Fig. 16). Flowering material has been collected in March and June.

**54. *Boronia amplexans*** Duretto, *Austral. Syst. Bot.* 10: 287 (1997). *Type:* Headwaters of the East Alligator River, 12°48'S 133°21'E, L.A. Craven and G.M. Wightman 8336, 31.iii.1984 (holotype CANB 399182; isotypes AD 99351079, MEL 722594).

Sprawling, much branched subshrub to 1 m wide. Multiangular stellate hairs with 6–10(–15) rays; rays appressed, 0.1–0.5 mm long. Branches terete, with a sparse to moderately dense stellate indumentum. Leaves with petiole 0.5–2.5 mm long; lamina narrowly elliptic, 15–52 mm long, 1.5–3 mm wide, with a sparse indumentum that is often confined to the margins and the midrib. Inflorescence 1-flowered, with a sparse to moderately dense stellate indumentum; peduncle 7–21 mm long; prophylls (0.5–)1–1.5 mm long, to 0.5 mm wide; metaxephylls minute to 0.5 mm long; anthopodium 2–8 mm long. Sepals acute to acuminate, 3–5 mm long, 1.5–2 mm wide, enlarging to 7 mm long as fruit matures; adaxial surface with a moderately dense and minute indumentum along the margins, becoming glabrous towards centre and base; abaxial surface with a sparse to moderately dense stellate indumentum. Petals 3–4 mm long, enlarging to 5 mm long as fruit matures; adaxial surface with a sparse simple indumentum; abaxial surface with a sparse moderately dense stellate indumentum. Antesepalous filaments 1.5–1.75 mm long, prominently glandular on the distal 0.5 mm; antepetalous filaments slightly glandular, c. 1 mm long; abaxial surface of anther not frosty, anther-apiculum absent or minute. Style glabrous. Ovary c. 4.5 mm long, 2–2.5 mm wide, with a sparse to moderately dense stellate indumentum. Seed c. 4 mm long, c. 2 mm wide, .

*Additional Specimen examined:* THE NORTHERN TERRITORY; DARWIN and GULF COUNTRY: S of Magela Falls, c. 12°47'S 133°06'E, K. Brennan 2818, 21.v.1994 (MEL, OSS n.v.).

*Notes:* *Boronia amplexans* differs from other members of subseries *Grandisepalae* by having narrowly elliptical leaves (1.5–3 mm wide) with a sparse indumentum of appressed hairs.

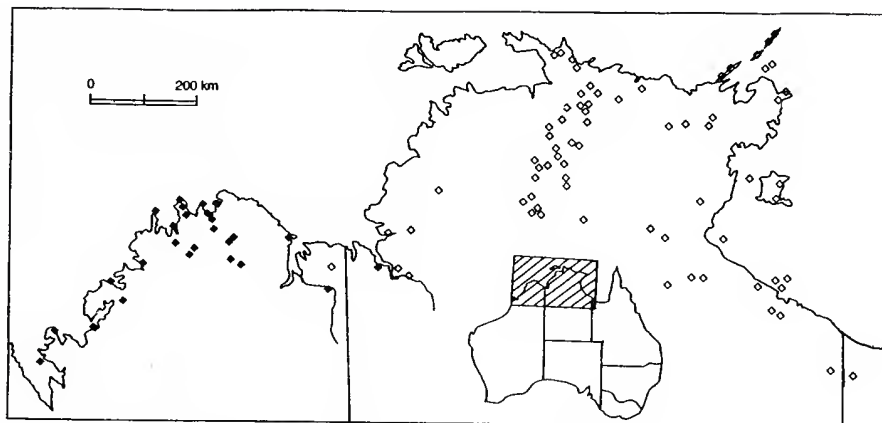
*Distribution and ecology:* This species is known from two collections from the interior of the Arnhem Land plateau, Northern Territory (Fig. 16), where it is found growing in shrubby eucalypt woodland on rocky sandstone slopes. Flowering and fruiting material has been collected in March and May.

*Conservation status:* Duretto and Ladiges (1997) gave a ROTAP code of 1K to *B. amplexans*, but as more material has come to hand a ROTAP code of 2Y is more appropriate.

***Boronia* scet. *Valvatae* subsect. *Grandisepalae* ser. 3. *Lanuginosae*** Duretto, ser. nov.  
Folia pinnata. Filamenta antipetala laevia. *Sp. typica:* *B. lanuginosa* Endl.

Erect or spreading shrubs, glabrescent or with a sparse to dense, stellate indumentum on the branches, leaves, inflorescence parts and abaxial surfaces of the perianth. Multiangular stellate hairs sessile; rays to 1 mm long, smooth, straight. Branches terete to slightly quadrangular, decurrent leaf bases absent. Leaves imparipinnate or rarely simple (*B. pauciflora*), lamina discolorous, paler beneath, epicuticular wax platelets absent, the margins plane to revolute, dorsiventral or isobilateral; the midrib impressed on the adaxial surface, prominently raised on the abaxial surface or not, without secondary thickening (except sometimes *B. pauciflora*) in cells between midvein and abaxial epidermis. Prophylls minute or minutely unifoliate or minutely imparipinnate;





**Fig. 17.** Distribution of *Boronia* subseries *Lanuginosae*: *B. lanuginosa* (◊), *B. wilsonii* (◆). Adapted from Duretto (1997), fig. 1.

metaxyphylls absent or minute. Sepals as large or larger than petals (rarely smaller), acute or acuminate. Antepetalous filaments smooth; anther-apiculum absent or present. Style glabrous or hirsute. Seeds black, shiny; surface at magnification tuberculate-colliculate; tubercles unfused.

A series of three subseries and nine species of the Kimberley Region, Western Australia, the 'Top End' of the Northern Territory and north-western Queensland (Figs 17, 18). It is characterised by imparipinnate leaves (though adult foliage of *B. pauciflora* is simple) without secondary thickening in the midrib. This series corresponds to the *B. lanuginosa* group discussed in Duretto (1997).

*Boronia* sect. *Valvatae* subsect. *Grandisepalae* ser. *Lanuginosae* Duretto subser. 1.  
*Lanuginosae*

Erect shrubs, juvenile plants with a sparse to moderately dense stellate indumentum, adult plants with a dense, stellate indumentum. Leaves petiolate, sometimes sessile; rachis segments triangular; leaflets dorsiventral, narrowly elliptic to linear, the younger distal leaves not becoming unifoliate, margins revolute or strongly recurved, the midrib raised on the abaxial surface. Sepals larger than petals. Cocci with a moderately dense to dense indumentum. Seeds black, concolourous.

A subseries of two widespread species of the Kimberley Region of Western Australia, the 'Top End' of the Northern Territory and north-western Queensland (Fig. 17). It is characterised by a dense indumentum throughout (at least on the adult foliage), narrow linear to elliptic leaflets with recurved to revolute margins and raised midribs on the abaxial surface. This subseries was the subject of the phenetic analysis presented by Duretto (1997).

55. *Boronia lanuginosa* Endl. in Endl. *et al.*, *Enum. pl.* 16 (1837). Type: King George's Sound [probably Gulf of Carpentaria, Northern Territory], *Ferd Bauer* (lectotype (Duretto 1997): W n.v. (photograph PERTH 1610171)).

[*Boronia artemisioides* F. Muell., *Hooker's J. Bot. Kew Gard. Misc.* 9: 196 (1857). *nom. inval.*, provisional name only]

*Boronia artemisiifolia* F. Muell., *Fragm.* 1: 66 (1859) (as *B. artemisifolia*). *Types* (Duretto 1997): In montibus rapid fluvibus flum Fitzmarie River [c. 14°49' 130°E, Northern Territory], F. Muell., x.1855 (syntypes K *n.v.* (cibachrome MEL 2041209, photograph AD 99537192, right hand specimen), MEL 2041250); Sea Range [= Yambarran Ra., c. 15°20'S 130°10'E, Northern Territory], F. Mueller, xii.1855 (syntypes K *n.v.* (cibachrome MEL 2041209, photograph AD 99537192, left hand specimen), MEL 2041251); McAdam's Range [Macadam Ra., c. 14°32'S 129°57'E, Northern Territory], F. Mueller, October 1855 (syntype TCD (transparency MEL 2044561)).

*Boronia affinis* R.Br. ex Benth., *Fl. austral.* 1: 311 (1863). *Types* (Duretto 1997): Islands g, h [North Island - 15°35'S 136°52'E, and Vanderlin Island - 15°40'S 137°E, Sir Edward Pellew Group] of the Gulf of Carpentaria and mainland opposite Groote Island [Eylandt] [Northern Territory], R. Brown No. 5293, xii.1802-i.1803 (syntypes BM *n.v.* (transparencies DNA, MEL 2041222), CANB 278461, K *n.v.* (cibachrome MEL 2041210, photograph AD 99537210), MEL 2041248, NSW).

*Illustrations*: P. Wilson, *Austral. Pl.* 8: 200 (1975); K. Brnann, *Wildflowers of Kakadu*, 14, fig. 9 (1986, as *Boronia* sp.); J. Brock, *Top End Native Plants*, 99 (1988); J. Brock, *Native Plants of Northern Australia*, 99 (1993).

Erect, much branched shrub to 1.5 m high; ontogenetic sequence in indumentum density on the branches, leaves, inflorescence parts and abaxial surfaces of the perianth: juvenile plants initially glabrous or glabrescent or sparsely simple- and/or stellate-indumented, the density of the indumentum increasing with each node until with a dense, stellate indumentum with or without simple hairs, this gradation varies between the different organs and some plants never have a dense stellate indumentum. Multiangular stellate hairs with 2–15 rays; rays white to faintly yellow, to 1 mm long; simple hairs antrorse, 0.5–1(–2) mm long. Leaves 6–80 mm long, 5–50 mm wide in outline, with 11–27(–35) leaflets; petiole 0.5–3 mm long, not winged; rachis segments 0.5–10 mm long, 1–1.5 mm wide, winged, wedge shaped with the distal end wider; leaflets sessile, linear to narrowly elliptic, acute; terminal leaflet 5–26 mm long, 0.5–3 mm wide; lateral leaflets 4–26 mm long, 0.5–2 mm wide. Peduncle absent or to 1 mm long; prophylls linear, minute to minutely unifoliate, to 0.5 mm long; metaxyphylls absent or minute; anthopodium 4–10 mm long. Sepals white to deep pink or purple, ovate-deltate, acute to acuminate, (4–5–)7–14 mm long, 2–4 mm wide, enlarging to 8–15 mm long as fruit matures; adaxial surface densely and minutely pubescent sometimes becoming glabrous towards centre and base. Petals white to dark pink or purple, 3–9 mm long, 1–2 mm wide, enlarging to 5.5–10 mm long and 1.5–2.5 wide as fruit matures, midvein not or slightly raised at the base of the abaxial surface; adaxial surface with a sparse to moderately dense simple or stellate indumentum, becoming glabrous towards base. Antesepalous filaments 1.5–2 mm long, prominently glandular on the distal 0.5–1 mm; antepetalous filaments 1–1.5 mm long; abaxial surface of anther not or slightly frosty, anther-apiculum absent. Style glabrous. Cocci 4.5–6 mm long, 2–2.5 mm wide, with a moderately dense to dense simple and/or stellate indumentum. Seeds 4–4.5 mm long, 2–2.5 mm wide. *Engbajengbaja*, *Star Boronia*.

*Selected specimens examined* (of c. 200 collections): THE NORTHERN TERRITORY; DARWIN and GULF COUNTRY: Wessell Is., 11°13'S 136°38'S, *P.K. Latz* 3462, 10.x.1972 (CANB, DNA, PERTH); Nhulunbuy, Gove Peninsular, 12°10'S 136°46'E, *G.M. Wighman* 4283, 21.i.1988 (CANB, DNA); 5 miles NE of Goyder R. Crossing, 12°51'S 135°02'E, *J. Must* 1018, 17.vi.1972 (DNA, CANB); Groote Eylandt, 6 km S of Alyangula, 13°55'S 136°26'E, *I. Cowie*

2006 and I.C. Brocklehurst, 11.ix.1991 (CANB, MEL, PERTH); 8 km W of Roper Bar, 14°42'S 134°27'E, M.O. Parker 908, 22.vi.1977 (BRI, CANB, DNA, NSW); Nathan River Station, 15°35'S 135°22'E, G. Brown, 9.vii.1985 (DNA); 42.4 km from Borroloola towards Wollgorang, 16°8.01'S 136°36.70'E, M.F. Duretto 495-502, 21.vi.1993 (MFD495-498, 501, 502: MEL; MFD499: DNA, MEL; MFD500: DNA, CANB, MEL); c. 1.6 km W of Echo Gorge on the road from Wollgorang to 'Calvert Hills', 17°11'S 137°39'E, R. Pullen 9233, 12.v.1974 (AD, BRI, CANB, DNA); Tin Camp Ck, c. 20 miles S of Nabarlek mining camp, 12°28'S 133°15'E, T.G. Hartley 13828, 30.v.1973 (CANB, DNA); Mt Cahill, Kakadu NP, SE of summit, 12°52.00'S 132°42.27'E, M.F. Duretto 448-453, J. Chappill and G. Howell, 16.vi.1993 (MEL); East Alligator R. headwaters, 12°48'S 133°21'E, G. Wightman 1374 and L. Craven, 31.iii.1984 (BRI, CANB, DNA, MEL); Sandstone outlier, 10 km N of Twin Falls, 13°13.5'S 132°47'E, M. Lazarides 9044, 28.v.1980 (AD, CANB, DNA); 14 km E of Sleisbeck, Kakadu NP, 13°46'S 132°58'E, G.J. Leach 2757 and I.D. Cowie, 18.iv.1990 (BRI, MEL, PERTH); c. 500 m W of Upper Falls, c. 600 m (by track) E of Edith Falls camp ground, Nitmiluk NP, 14°10'50"S 132°11'15"E, B.J. Conn 3709 and A.N.L. Doust, 15.iii.1993 (DNA, MEL, NSW); 7 km E of 'Beswick' Homestead along road to Mainora, 14°32'S 133°16'E, J. D. Briggs 879, 10.v.1983 (CANB, MEL); VICTORIA RIVER REGION: 4 km W of Kodondong Valley, 14°38'51"S 130°10'55"E, I. Cowie 4874 and D.E. Albrecht, 13.v.1994 (DNA, MEL); Victoria R., Gregory NP, 15°28'S 130°07'E, M. Clark 436 and G. Wightman, 7.ii.1986 (DNA); 20 km S of Daly R. Police Station (3 km S of Mt Boulder), 13°57'S 130°42'E, P.A. Fryxell, L.A. Craven and J. McD.Stewart 4907, 23.vi.1985 (CANB); WESTERN AUSTRALIA, KIMBERLEY REGION: Limestone hills W of Weaber Range, c. 50 km N of Kununurra and c. 13 km NW of Point Springs, M. Lazarides 8426, 8.iii.1978 (CANB, DNA, PERTH); QUEENSLAND, BURKE REGION: Westmoreland, off road past Hells Gate, 17°22'59"S 138°16'57"E, P. Forster 21066, 21069 & R. Booth, 23.v.1997 (BRI n.v., MEL).

*Possible hybrids:* *Boronia lanuginosa* X *B. tolerans* (see Duretto 1997). On track to and near Biddlecombe Cascades, Nitmiluk NP, 14°16'S 132°26'E, M.F. Duretto 525-526, 28.vi.1993 (MFD525: DNA, MEL; MFD526: MEL).

*Notes:* The density of the indumentum of *B. lanuginosa* is variable. It is not unusual for glabrescent plants to be found alongside plants with a dense indumentum (see discussion in Duretto 1997). Plant size is also variable and some populations, e.g. at Mt Cahill (Kakadu N.P.) and on the sandplains north of the Arnhem Land Plateau, consist of very small plants that may possibly behave as annuals. Plants from the south-western portion of the Arnhem Land plateau and western Northern Territory have larger flowers than the typical form. These forms appear to grade into each other (Duretto 1997). More collections and further research are required to determine if any of these forms require formal recognition.

*Boronia lanuginosa* is called *Engbajengbaja* by the Warnindilyakwa people of Groote Eylandt who use a preparation made from the leaves to treat headaches, body aches and pains, and chest colds (Levitt 1981).

Duretto (1997) erred when stating that one of the syntypes of *B. artemisiifolia*, viz. 'McAdam Ranges, F. Mueller, October 1855', was lodged at BM and MEL: only the collection at TCD has been seen.

*Distribution and ecology:* *Boronia lanuginosa* is common and widespread throughout the 'Top End' of the Northern Territory from Wollgorang to the Arnhem Land plateau and Cobourg Peninsula areas (Fig. 17). Isolated collections have also been made further east in the Macadam Range and Victoria River areas (NT) and the Weaber Range (WA), and the species was recently collected in north-western Queensland. It grows on sandstone and sands in heath, open woodland and forest. Flowering: January-September; fruiting: January-November.

*Conservation status:* Common, widespread, not under threat: found in a number of reserves including Kakadu N.P. and Nitmiluk N.P. (Duretto 1997).

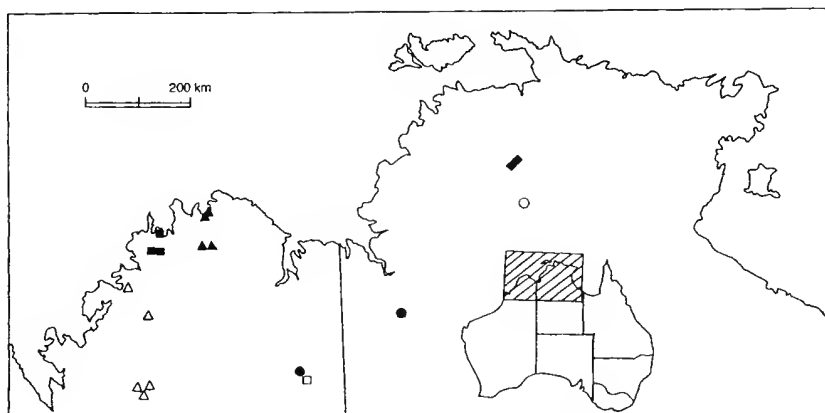
56. *Boronia wilsonii* (F. Muell. ex Benth.) Duretto, *Nuytsia* 11: 320 (1997). *B. artemisiifolia* var. *wilsonii* F. Muell. ex Benth., *Fl. austral.* 1: 311 (1863). *Type*: Vansittart's Bay [c. 14°S 126°15'E, Western Australia], *Alan Cunningham* 432, 1819 (lectotype (Duretto 1997) PERTH 1610198; isoelectotypes BM *n.v.* (transparencies MEL 2041234, PERTH), K x2 *n.v.* (cibachrome MEL 2041211, left hand specimen; MEL 2041212, left hand specimen)); Victoria River [c. 15°31'S 131°E, Northern Territory], *Wilson* (residual syntypes K *n.v.* (cibachrome MEL 2041213; photograph AD 99537195), MEL 2041252); N.W. Coast, *Bynoe* (residual syntype K *n.v.* (cibachrome MEL 2041212, right hand specimen; MEL 2041211, right hand specimen)).

*Illustration*: J.R. Wheeler, *Fl. Kimberley Region*, 669, Figs 206 B1-2 (1992, as *B. lanuginosa*).

Erect, much branched shrub to 1 m high, with a dense, stellate indumentum on the branches, leaves, inflorescence parts and abaxial surface of the perianth. Multiangular stellate hairs with 4–12 rays; rays white to faintly yellow, 0.05–0.1(–0.25) mm long; simple hairs present, antrorse, 0.5–2 mm long. Branches becoming glabrous as they age. Leaves 17–34(–61) mm long, 6–21 mm wide in outline, with 13–23 leaflets; petiole 0.5–7 mm long, not winged; rachis segments 2–6 mm long, 1–2.5 mm wide, winged, wedge shaped with the distal end wider; leaflets sessile to subsessile, narrowly elliptic to elliptic or lanceolate, acute, the margins recurved to revolute; terminal leaflet 3–23 mm long, 1–6 mm wide; lateral leaflets 1.5–12 mm long, 1–4 mm wide. Inflorescence 1(–3)-flowered; peduncle absent; prophylls 0.5–1(–9) mm long, up to 4 mm wide; anthopodium 2.5–7 mm long. Sepals cream to pink, ovate-deltate, acuminate, 5–9 mm long, 2–3 mm wide, enlarging to 6–10 mm long and 3–4.5 mm wide as fruit matures; adaxial surface with a dense stellate and simple indumentum near the margins, becoming sparse simple towards centre and glabrous towards base. Petals cream to pink, 4–5 mm long, 1.5–2.5 mm wide, enlarging to 5.5–6 mm long as fruit matures, midvein not or slightly raised at the base of the abaxial surface; adaxial surface with a sparse simple indumentum, becoming glabrous towards base. Antesepalous filaments 1.5–2 mm long, prominently glandular on the distal 0.5–1 mm; antepetalous filaments 1–1.5 mm long; abaxial surface of anther not or slightly frosty, anther-apiculum minute. Style glabrous or rarely hirsute. Cocci 4–5 mm long, 2–2.5 mm wide, with a moderately dense to dense simple and/or stellate indumentum. Seeds 3.5–4.5 mm long, 2–2.5 mm wide.

*Selected specimens examined* (of c. 50 collections): WESTERN AUSTRALIA; KIMBERLEY REGION: Lachlan Is., Buccaneer Archipelago, 16°38'S 123°29'E, *K.F. Kenneally* 8319, 14.vi.1982 (CANB, PERTH); Koolan Is., 16°7'S 123°46'E, *P.A. Fryxell, L.A. Craven* and *J. McD.Stewart* 4600, 2.vi.1985 (CANB, PERTH); Uwins Is., Brunswick Bay, 15°18'S 124°48'E, *P.G. Wilson* 11434, 7.vii.1973 (PERTH); Peninsula NE of Fredrick Harbour at mouth of Hunter R., 15°1'S 125°23'E, *P.A. Fryxell, L.A. Craven* and *J. McD.Stewart* 4685, 8.vi.1985 (CANB, MEL, PERTH); Bougainville, on plateau, 13°54'S 126°4'E, *J.S. Beard* 8260, 10.ix.1978 (CANB, PERTH); King Edward R., 14°54'S 126°12'E, *C.R. Dunlop* 5380, 1.iii.1980 (DNA, PERTH); Anjo Peninsula separating Napier Broome Bay and Vansittart Bay, c. 3.5 km SSW Sharp Point, 13°57'30"S 126°31'E, *J.H. Willis s.n.*, 31.v.1984 (BRI, CANB, MEL, NSW, PERTH); 2 km N of Kalumburu Mission, 14°16'S 126°37'E, *P.A. Fryxell* and *L.A. Craven* 4134, 14.v.1983 (CANB, MEL, PERTH); Napier Broome Bay, West Governor Is., South Bay, 13°57'S 126°41'E, *S.J. Forbes* 2059, 19.v.1984 (MEL, NSW); Planigale Ck, Drysdale R. NP, 14°43'S 126°54'E, *K.F. Kenneally* 4455, 19.viii.1975 (CANB, PERTH); Above the headwaters of the Helby R., 14°41'S 128°4'E, *T.G. Hartley* 14829, 27.iii.1978 (CANB, PERTH); Middle Springs, 18 km NW of Kununarra, 15°38'S 128°40'E, *P.A. Fryxell* and *L.A. Craven* 4002, 8.v.1985 (AD, BRI, CANB, DNA, MEL,





**Fig. 18.** Distribution of *Boronia* subseries *Jucundae*: *B. decumbens* (◆), *B. tolerans* (○), *B. jucunda* (●); subseries *Filicifoliae*: *B. pauciflora* (△), *B. kalumburuensis* (▲), *B. filicifolia* (■), *B. minutipinna* (□). Adapted from Duretto (1997), fig. 12.

PERTH); Parry Harbour on the Mainland near Troughton Is., *F. Lullfitz* 6109, 16.vi.1968 (PERTH); Lawley R., *G.A. Gardner* 963, 4.iv.1921 (PERTH); THE NORTHERN TERRITORY; VICTORIA RIVER REGION: Victoria R. area, 15°16'S 129°35'E, *G.J. Leach* 2399 and *C. Dunlop*, 9.iii.1989 (BRI, DNA).

*Notes:* *Boronia wilsonii* differs from *B. lanuginosa* by having wider and usually shorter leaflets and longer anthopodia. The many references to *B. lanuginosa* in the Kimberley can probably be referred to *B. wilsonii* (see Duretto 1997 and references therein).

*Distribution and ecology:* *Boronia wilsonii* is common in the Kimberley Region and adjacent islands (Western Australia), though rarely collected far from the coast, and from few collections from the lower Victoria River, Northern Territory (Fig. 17). It grows on sand, sandstone, quartzite and rarely limestone. Flowering: January-September; fruiting: March-September.

*Conservation status:* Common, widespread and under no immediate threat. Found in several reserves.

***Boronia* sect. *Valvatae* subsect. *Grandisepalae* ser. *Lanuginosae* subser. 2. *Jucundae***  
Duretto, subser. nov. Indumento sparso ubiquo. Folia sessilia; foliola plana abaxiale, margine plano vel recurvo leviter. *Sp. typica:* *B. jucunda* Duretto

Erect or decumbent shrubs, glabrescent or with a sparse to moderately dense stellate indumentum on the branches, leaves and inflorescence parts. Leaves sessile, the younger distal leaves not becoming unifoliate; rachis segments triangular; leaflets linear to narrowly elliptic, the margins plane to slightly recurved, the midrib not or slightly raised on the abaxial surface, sometimes impressed on the adaxial surface, dorsiventral or isobilateral. Peduncle absent or rarely to 0.5 mm long; metaxyphylls minute to 1 mm long. Sepals larger than petals. Cocci glabrous or with a sparse to moderately dense indumentum. Seeds black, usually concolourous (see *B. jucunda*, species 59 below).

A subseries of three rare species of the Northern Territory with one extending into the south-eastern Kimberley Region of Western Australia (Fig. 18). It is characterised by having a sparse indumentum, and sessile leaves with plane, linear leaflets.

57. *Boronia decumbens* Duretto, *Nuytsia* 11: 323 (1997), figs 10A-E. *Type*: c. 70 km NE of Pine Creek, El Sharana Rd, 13°33'S 132°18'E, *C. Dunlop* 6752 and *G. Wightman*, 5.iii.1985 (holotype CANB 363098; isotypes DNA, MEL 250904, NSW).

Decumbent, much branched subshrub to 10 cm high and 40 cm wide, resprouting from a woody rootstalk, with a sparse to moderately dense simple indumentum on the branches, leaves and inflorescence parts. Multiangular stellate hairs rare, with 2–6 rays; rays to 0.1 mm long. Branches weak, terete to slightly quadrangular, becoming glabrous as they age. Leaves 6–20 mm long, 8–25 mm wide in outline, with (3)–5–7 leaflets, not obviously glandular; rachis segments 2–8 mm long, 0.5–1 mm wide; leaflets linear to narrowly elliptic, acute, attenuate, dorsiventral, the midrib not or slightly raised on the abaxial surface and not impressed on the adaxial surface; terminal leaflet 6–12 mm long, 0.5–1 mm wide, larger than preceding lateral leaflets; lateral leaflets 4–11 mm long, 0.5–1 mm wide. Inflorescence 1-flowered; peduncle absent; prophylls linear, minute to minutely unifoliate, 0.5–2 mm long; metaxephylls minute to 1 mm long; anthopodium 1–4 mm long. Sepals white to pink, deltate, acute, 4–6 mm long, 1.5–3 mm wide, enlarging to 5.5–8 mm long and 2–4 mm wide as fruit matures; adaxial surface with a moderately dense simple indumentum and becoming glabrous towards the base; abaxial surface with a sparse simple indumentum. Petals white to pink, 3–5 mm long, 1–2 mm wide, enlarging to 4–5.5 mm long as fruit matures; adaxial surface with a sparse to moderately dense simple indumentum, becoming glabrous towards base; abaxial surface with a sparse to moderately dense simple indumentum. Antesepalous filaments c. 1.5 mm long, prominently glandular on the distal 0.5–1 mm; antepetalous filaments c. 1 mm long; abaxial surface of anther not frosty, anther-apiculum minute or large and erect. Style glabrous. Cocci 5–6 mm long, 2–2.5 mm wide, with a sparse to moderately dense simple and stellate indumentum. Seeds 4.5–5 mm long, c. 2 mm wide.

*Selected specimens examined (of 15 collections)*: THE NORTHERN TERRITORY; DARWIN and GULF COUNTRY: Kakadu NP, 3 km SW of Mary River Ranger Station, 13°24'S 132°05'E, *A. V. Slee* and *L. A. Craven* 2494, 17.iv.1990 (AD, CANB); N of Waterfall Ck turn off on Pine Creek-Oenpelli Rd, Kakadu NP, 13°33'S 132°17'E, *M. F. Duretto* 473–475, *J. Chappill* and *G. Howell*, 18.vi.1993 (*MFD473*: MEL; *MFD474*: CANB, DNA, MEL; *MFD475*: DNA, MEL); Mary River Ranger Station, 13°33'S 132°16'E, *M. F. Duretto* 548b–550, *J. Chappill* and *G. Howell*, 1.vii.1993 (*MFD548b*, 549: DNA, CANB, MEL; *MFD550*: MEL); Kombolgie Ck, Fern Gully, Fern Ck, 13°34'S 132°18'E, *G. J. Leach* 3407, iv.1993 (BRI, PERTH); Moline Rockhole area, Kakadu Hwy, 13°35'S 132°15'E, *M. J. Clark* 835, 19.iii.1987 (DNA).

*Notes*: *Boronia decumbens* differs from *B. lanuginosa* by its sessile leaves, few (if any) stellate hairs and decumbent habit; the last two features also distinguish it from *B. tolerans* and *B. jucunda*.

*Distribution and ecology*: This species is restricted to Kakadu N.P. to the area north of Mary River around the Mary River Ranger Station and the Waterfall Creek turnoff on the Pine Creek-Oenpelli Rd, Northern Territory (Fig. 18). It grows on deep sand as well as on sandstone in eucalypt open woodland. Flowering: November–August. Fruiting: March–August.

*Conservation status*: 2RC- (Duretto 1997).

58. *Boronia tolerans* Duretto, *Nuytsia* 11: 326 (1997), figs 10 F-J. *Type*: On track to and near Biddlecombe Cascades, Nitmiluk NP, 14°16'S 132°26'E, *M. F. Duretto* 516, *J. Chappill* and *G. Howell*, 28.vi.1993 (holotype MEL 2040275; isotypes DNA, MEL 2040276).

Erect, much branched shrub to 50 cm high. Multiangular stellate hairs sessile, 4–12 rays;

rays white to faintly yellow, 0.05–0.25(–0.5) mm long; simple hairs on vegetative organs antrorse, 0.5–1 mm long. Branches terete to slightly quadrangular, with a sparse to moderately dense simple and stellate indumentum, becoming glabrous as they age. Leaves 7–50 mm long, 8–17 mm wide in outline, with (1–3–)5–7(–9) leaflets, slightly glandular, glabrous to glabrescent; rachis segments 2–10 mm long, 1–2 mm wide; lamina isobilateral; terminal leaflet 8–25 mm long, 1–2.5 mm wide; lateral leaflets 5–16 mm long, 1–2 mm wide. Inflorescence 1-flowered, glabrous or with a sparse simple and stellate indumentum; peduncle absent; prophylls linear, minute, to 0.5 mm long; metaxyphylls absent or minute; anthopodium 1–2 mm long. Sepals white, ovate-deltate, acute, 4–5 mm long, c. 1.5 mm wide, enlarging to 5.5–6 mm long and 2–2.5 mm wide as fruit matures; adaxial surface with a moderately dense and minute indumentum, becoming glabrous towards the base; abaxial surface glabrous or with a sparse simple or stellate indumentum. Petals white, 3.5–4.5 mm long, c. 1 mm wide, enlarging to 5 mm long as fruit matures; adaxial surface with a sparse to moderately dense simple or stellate indumentum, becoming glabrous towards base; abaxial surface glabrous to glabrescent. Antesepalous filaments c. 1.5 mm long, prominently glandular on the distal 0.5 mm; antepetalous filaments c. 1 mm long; abaxial surface of anther not or slightly frosty, anther-apiculum minute to large, erect. Style glabrous. Cocci 5–6 mm long, 2–3 mm wide, glabrous or with a sparse indumentum. Seeds 4–4.5 mm long, 2–2.5 mm wide.

*Selected specimens examined (of three collections):* THE NORTHERN TERRITORY; DARWIN and GULF COUNTRY: Biddlecombe Cascades, Katherine Gorge NP, *S. King*, 16.vi.1981 (DNA); 3 km E of Biddlecombe Cascades, Katherine Gorge NP, *S. King*, 20.vi.1981 (DNA).

*Possible hybrids:* *Boronia tolerans* X *B. lanuginosa* (see *B. lanuginosa* species 55 above; Duretto 1997).

*Notes:* *Boronia tolerans* differs from *B. jucunda* by having up to seven leaflets and smooth stems, from *B. decumbens* by its erect habit, and from *B. lanuginosa* by its sessile and isobilateral leaves.

*Distribution and ecology:* This species is restricted to the Biddlecombe Cascades area of Nitmiluk N.P., Northern Territory (Fig. 18), where it grows on deep sand in eucalypt woodland on the plateau top. Flowering and fruiting material collected in June.

*Conservation status:* 2VC- (Duretto 1997).

- 59. *Boronia jucunda*** Duretto, *Nuytsia* 11: 328 (1997), figs 10 K–O. *Type:* Mabel Downs, Winnama Gorge, Kimberley Region, WA, 17°11'S 128°15'E, *E.A. Chesterfield* 214, 14.v.1984 (holotype MEL 1534494; isotypes CANB [CBG 8503155], DNA 56026, NSW 166827, PERTH 1622609).

*Boronia* ? *pauciflora* sensu Forbes and Kenneally (1986, p. 161); Menkhurst and Cowie (1992, p. 44).

*Boronia* sp. A sensu Wheeler (1992, pp. 669, 670).

*Illustrations:* J.R. Wheeler, *Fl. Kimberley Region*, 669, figs 206 D1–3 (1992, as *Boronia* sp. A).

Erect, much branched shrub to 50 cm high. Multiangular stellate hairs sessile, 4–12 rays; rays 0.05–0.1 mm long; simple hairs antrorse, 0.5–1 mm long. Branches slightly quadrangular, glandular, with a sparse to moderately dense simple and stellate indumentum or glabrescent (NT, *Napier* 7, DNA). Leaves trifoliolate, slightly glandular, glabrous to glabrescent, lamina isobilateral; terminal leaflet 8–42 mm long, 1–3 mm wide, midvein straight; lateral leaflets 6–23 mm long, 1–2 mm wide. Inflorescence 1-

flowered, glabrous or with a sparse simple and stellate indumentum; peduncle absent or 0.5 mm long; prophylls linear, minute, to 0.5 mm long; metaxyphylls absent or minute; anthopodium 0.5–3 mm long. Sepals white, ovate-deltate, acute, (3–)4–5 mm long, 1.5–2.5 mm wide, enlarging to (3.5–)5.5–6 mm long and 2–2.5 mm wide as fruit matures; adaxial surface with a moderately dense stellate indumentum, becoming glabrous towards the base; abaxial surface glabrous or with a sparse indumentum. Petals white, (2–)3.5–4 mm long, c. 1 mm wide, not enlarging significantly as fruit matures; adaxial surface with a moderately dense simple or stellate indumentum, becoming glabrous towards base; abaxial surface glabrous or with a sparse simple and stellate indumentum. Antesepalous filaments 1.5–2 mm long, prominently glandular on the distal 0.5–1 mm; antepetalous filaments c. 1 mm long; abaxial surface of anther not frosty, anther-apiculus minute to large, erect. Style hirsute at base or for full length. Cocci 5–6 mm long, 3–3.5 mm wide, with a sparse indumentum. Seeds black, rarely mottled, 4.5–5 mm long, 2–3 mm wide.

*Additional specimens examined:* WESTERN AUSTRALIA, KIMBERLEY REGION: SE Kimberley, Winnama Spring c. 17.5 km S of Turkey Ck, 17°11'S 128°15'E, J.H. Willis, 15.v.1984 (CANB, MEL, PERTH); Escarpment edge, S side of Winnama Gorge, 17°11'S 128°15'E, M.F. Duretto 505-509 and G. Howell, 25.vi.1993 (MFD505: DNA, MEL, PERTH; MFD506: MEL; MFD507, 509: CANB, DNA, MEL, NSW, PERTH; MFD508: DNA, MEL); NORTHERN TERRITORY, VICTORIA RIVER REGION: Gregory N.P., 16°29'S 130°28'E, D.L. Napier 7, 12.x.1997 (DNA).

*Notes:* *Boronia jucunda* differs from *B. tolerans* and *B. decumbens* by always being trifoliolate and by having obviously glandular stems.

The collection from Gregory N.P. in the Northern Territory (Napier 7, DNA) differs from the Winnama population in its glabrescent stems and smaller floral parts: the sepals are 3–3.5 mm long (as apposed to 4–6 mm long) and the petals are 2–2.5 mm long (as apposed to 3.5–4 mm long). Further surveys are required to ascertain if these differences warrant taxonomic recognition.

*Distribution and ecology:* When Duretto (1997) described *B. jucunda* it was then known only from the edge of Winnama Gorge (south-east Kimberley Region, Western Australia). There it grows on small, quartzite outcrops in open eucalypt woodland that has an understorey of *Triodea* spp. Recently, *B. jucunda* was collected c. 250 km east-north-east of Winnama Gorge in Gregory N.P. (Northern Territory) where it was growing on a sandstone range (collectors notes). Flowering and fruiting material has been collected in May, June and October.

*Conservation status:* A ROTAP code of 2R was applied to *B. jucunda* by Duretto (1997) but with the recent, disjunct collection of the species in Gregory N.P. a ROTAP code of 3RC- is more appropriate.

***Boronia* sect. *Valvatae* subsect. *Grandisepalae* ser. *Lanuginosae* subser. 3. *Filicifoliae* Duretto, subser. nov. Indumentum sparsum ad moderatum ubique. Anthopodium longum. Semina maculosa. *Sp. typica:* *B. filicifolia* A. Cunn. ex Benth.**

Erect shrubs, glabrous or with a sparse to moderately dense stellate indumentum on the branches, leaves, inflorescence parts and the abaxial surface of the perianth. Branch hair distribution even or concentrated in areas below leaf base. Leaves imparipinnate or simple (*B. pauciflora*), ± sessile, with 1–51 leaflets; rachis segments triangular or elliptical; leaflets rhombic to elliptical, dorsiventral, the margins plane to recurved, the midrib raised on the abaxial surface if only slightly, usually impressed on the adaxial surface. Peduncle absent; prophylls to 1 mm long; metaxyphylls absent or minute. Sepals as large or larger than petals or rarely smaller (*B. filicifolia*). Cocci glabrous or with a sparse indumentum. Seeds mottled.



A subseries of four species endemic to the Kimberley Region of Western Australia (Fig. 18), that is characterised by a sparse to moderately dense indumentum, long anthopodia and mottled seeds.

60. *Boronia pauciflora* W. Fitzg., *J. Proc. Roy. Soc. Western Australia* 3: 158 (1918).  
Type: Mount Broome, 1000 feet above the base, 17°21'0"S 125°22'42"E, W.V. Fitzgerald 825, v.1905 (lectotype (Duretto 1997): PERTH 1099701; isolectotypes K n.v. (transparencies MEL 2041221, PERTH; photograph AD 99548129), NSW).

*Illustration*: J.R. Wheeler, *Fl. Kimberley Region*, 669, Fig. 206 C (1992).

Erect, much branched shrub to 60 cm high. Multiangular stellate hairs with 2–8 rays; rays 0.1–0.2 mm long. Branches quadrangular, slightly glandular, with a sparse (sometimes moderately dense) stellate indumentum, the hairs mainly between the decurrent leaf bases, becoming glabrous as they age. Leaves simple and petiolate at maturity, juvenile leaves sessile and trifoliolate and produced for very few nodes; petiole 0.5–7 mm long, not winged; leaflets petiolate, petiolule 1–2 mm long; leaves or leaflets elliptical to lanceolate, acute, attenuate, glabrescent with a few scattered stellate and simple hairs, mainly on the midrib; the midrib raised on the abaxial surface, with or without secondary thickening in the cells between midvein and epidermis; simple leaves and terminal leaflet 12–80 mm long, 2–12 mm wide, longer than laterals; lateral leaflets 7–13 mm long, 2–4 mm wide. Inflorescence 1(–3)-flowered, glabrous or with a sparse stellate indumentum; prophylls minute-minutely unifoliolate, to 1 mm long; metaxyphylls absent or to 0.5 mm long; anthopodium 4–22 mm long. Sepals white to pink, c. same size as petals, ovate-deltate, acute to acuminate, 2.5–4.5 mm long, 1–2 mm wide, enlarging to 4.5–5 mm long as fruit matures; adaxial surface with a sparse simple indumentum becoming glabrous towards base; abaxial surface glabrous to glabrescent. Petals white to pink, 2–4.5 mm long, 1–1.5 mm wide, scarcely enlarging as fruit matures; adaxial surface with a sparse to moderately dense stellate indumentum, becoming glabrous towards base; abaxial surface with a sparse stellate indumentum. Filaments pilose below glandular tip; antesepalous filaments c. 2 mm long, the distal 1–1.5 mm prominently glandular; antepetalous filaments c. 1.5 mm long; abaxial surface of anther not or slightly frosty; anther-apiculum absent, glabrous. Style hirsute for full length. Cocci 5–6 mm long, 2–2.5 mm wide, glabrous. Seeds 4–4.5 mm long, 2–2.5 mm wide.

*Additional specimens examined*: WESTERN AUSTRALIA; KIMBERLEY REGION: Bold Bluff, King Leopold Ra., 17°16'S 125°15'E, *N. Byrnes* 2260, 25.v.1971 (CANB, DNA, PERTH); Leopold Ra., towards base of Bold Bluff, 17°17'S 125°25'E, *D.E. Symon* 7037, 26.v.1971 (MEL, PERTH); Foot of Bold Bluff, *C.H. Gittens* 1443, vii.1967 (NSW); Edkins Ra., c. 132 km from 'Mount Elizabeth' homestead along the Walcott inlet track, 16°02'S 125°28'E, *I.R. Telford* 11627, 1.v.1992 (PERTH); c. 10 km NE of Prince Regent R. mouth, 15°26'S 125°10'E, *L.A. Craven* 9212, *J. McD.Stewart* and *C.L. Brubaker*, 27.v.1993 (CANB, DNA, E, L, MEL, PERTH).

*Notes*: The Prince Regent River material differs from the King Leopold and that from the Edkins Ranges in having a greater hair density on the branches, longer anthopodia (on average), less acuminate sepals, and less hirsute staminal filaments. As the Prince Regent River collections are of seedlings, it is not known whether these differences are taxonomic or ontogenetic (Duretto 1997). The taxon referred to as *B. ? pauciflora* by Forbes and Kenneally (1986) and Menkhurst and Cowie (1992) is *B. jucunda*. *Boronia pauciflora* can be distinguished from the other *Boronia* species found in the Kimberley region by its simple, glabrescent, adult leaves.

*Distribution and ecology*: *Boronia pauciflora* is found in the King Leopold and Edkins Ranges, and from the Prince Regent River area, western Kimberley Region, Western

Australia. It grows in rocky (sandstones and quartzites) areas with spinifex (*Triodea spp.*) Flowering and fruiting: May–July.

*Conservation status:* *Boronia pauciflora* was given a ROTAP code of 3K Briggs and Leigh (1996) and a Priority Three rating, following the Western Australian Department of Conservation and Land Management for Western Australian taxa, by Hopper *et al.* (1990).

61. *Boronia kalumburuensis* Duretto, *Nuytsia* 11: 334 (1997), figs 10 P-S. *Type:* Outcropping sandstone immediately N of Kalumburu airstrip, 14°17'S 126°37'E, E.D. Edwards LAC9247, 22.v.1993 (holotype CANB 463023; isotypes DNA, MEL 234516, PERTH).

Erect, much branched shrub to 50 cm high, with a sparse to moderately dense stellate indumentum on the branches and leaves. Multiangular stellate hairs with 4–10 rays; rays to 0.5 mm long. Branches slightly quadrangular but becoming terete and glabrous as they age. Leaves 8–40 mm long, 4–14 mm wide in outline, with 15–27 leaflets, leaflets number gradually increasing along axillary branches, the younger distal leaves not becoming unifoliate; rachis segments 0.5–1.5 mm long, 0.5–1.5 mm wide, winged, wedge shaped with the distal end wider; petiole 1–2 mm long, not winged; leaflets subsessile, elliptic to lanceolate, acute; terminal leaflet lanceolate, 3–11 mm long, 1–3 mm wide, longer than laterals; lateral leaflets elliptic, 1–9 mm long, 0.5–2.5 mm wide. Inflorescence 1(–3)-flowered; anthopodium with a sparse to dense, stellate indumentum, 7–24 mm long. Sepals white to pink, longer and wider than petals, ovate-deltate, acute to acuminate, 3.5–5 mm long, 1.5–2.5 mm wide, enlarging to 5–6 mm long as fruit matures; adaxial surface with a moderately dense stellate indumentum, sometimes along the margins only; abaxial surface with a sparse stellate indumentum. Petals white to pink, 2.5–4 mm long, 1–2 mm wide, not enlarging significantly as fruit matures; adaxial surface with a sparse simple and stellate indumentum, becoming glabrous towards base; abaxial surface glabrous or with a sparse stellate indumentum. Filaments bearing stiff stellate and some simple hairs below glandular tip; antesealous filaments c. 1.5 mm long, prominently glandular on the distal 0.5–1 mm; antepetalous filaments c. 1 mm long; abaxial surface of anther not frosty; anther-apiculum absent or present, minute or large and erect, sometimes with few stiff simple hairs. Style hirsute at base or for full length. Cocci 5–5.5 mm long, 2–2.5 mm wide, glabrescent or with a sparse stellate indumentum. Seeds c. 4.5 mm long, c. 2.5 mm wide.

*Selected specimens examined (of seven collections):* WESTERN AUSTRALIA; KIMBERLEY REGION: c. 10 km N of Kalumburu Mission, 14°11'S 126°40'E, P.A. Fryxell and L.A. Craven 4131, 14.v.1983 (CANB, DNA, MEL, PERTH); quartzite outcrop between Kalumburu Mission and Longini Landing, 14°16'S 126°37'E, D.E. Symon 10184, 26.v.1975 (AD, CANB, PERTH); 4 km N Kalumburu, 14°17'S 126°37'E, A.S. George 15199, 24.vi.1978 (CANB, MEL, NSW, PERTH); Theda Station near Homestead on banks of Morgan R., 14°49'S 126°43'E, P.A. Fryxell, L.A. Craven and J. McD.Stewart 4858, 18.vi.1985 (CANB, MEL, PERTH).

*Notes:* *Boronia kalumburuensis* differs from *B. filicifolia* and *B. minutipinna* by a smaller number of leaflets and hirsute cocci. This last feature also distinguishes it from *B. pauciflora*. *Boronia kalumburuensis* can be distinguished from *B. wilsonii* (with which it is sympatric) by its sparse to moderately dense indumentum, much longer anthopodia, and smaller and less hirsute flowers.

*Distribution and ecology:* *Boronia kalumburuensis* is found in the Kalumburu area and south to Theda Station, north Kimberley Region, Western Australia (Fig. 18), where it grows mainly on sandstones and quartzites. Flowering and fruiting: May–July.

*Conservation status:* 2RC- (Duretto 1997).

62. *Boronia filicifolia* A. Cunn. ex Benth., *Fl. austral.* 1: 311 (1863). *Type*: Montague and York Sounds, N.W. Australia, A. *Cunningham* 220, third voyage of the 'Mermaid', 1820 (lectotype (Duretto 1997): K *n.v.* (cibachrome MEL 2041207, photograph AD 99537201); isolectotype BM *n.v.* (transparencies MEL 2041235, PERTH)); York Sound, N.W. Australia, A. *Cunningham* 219, third voyage of the 'Mermaid', 1820 (residual syntype BM *n.v.* (transparencies MEL 2041244)).

*Illustration*: J.R. Wheeler, *Fl. Kimberley Region*, 669, Figs 206 A1 and A2 (1992).

Erect, much branched shrub to 50 cm high, with a sparse to moderately dense stellate indumentum. Multiangular stellate hairs with 2–10 rays; rays to 0.25 mm long. Branches quadrangular, becoming terete and glabrous as they age. Leaves (7–11–)30–75 mm long, (3–)6–12 mm wide in outline, opposite decussate to subopposite, with (5–)15–55 leaflets, leaflets number gradually increasing along axillary branches, the younger distal leaves not becoming unifoliate; petiole absent or to 2 mm long, not winged; rachis segments (0.5–)2–7 mm long, 0.5–1 mm wide, winged, the distal end wider; leaflets acute, petiolule absent or to 1 mm long; terminal leaflet lanceolate, (1.5–)3–8 mm long, 1–5 mm wide, longer than laterals; lateral leaflets elliptic to rhombic, 0.5–5(–7) mm long, 0.5–3 mm wide. Inflorescence 1(–3)-flowered; prophylls minute; metaxephylls absent or minute; anthopodium glabrous or with a sparse to moderately dense stellate indumentum, (2–)6–22 mm long. Sepals white to pink, c. equal in size to or rarely smaller (Port Warrenda, *Keneally* 7763) than petals, ovate-deltate, acute, 2–3.5 mm long, 1.5–2 mm wide, not enlarging significantly as fruit matures; adaxial surface with a moderately dense stellate indumentum; abaxial surface glabrous or with a sparse stellate indumentum. Petals white to pink, 2.5–3.5 mm long, 1–1.5 mm wide, enlarging to 4 mm long as fruit matures; adaxial surface with a dense, stellate indumentum, becoming glabrous towards base; abaxial surface glabrous or with a sparse stellate indumentum. Filaments bearing stiff bifid and some simple hairs below glandular tip; antesealous filaments c. 1.5 mm long, prominently glandular on the distal 0.5 mm; abaxial surface of anther not or slightly frosty, glabrous; anther-apiculum absent or present, minute or large and erect, glabrous or bearing few simple erect hairs. Style hirsute for full length. Cocci c. 5 mm long, 2–2.5 mm wide, glabrous to glabrescent. Seed c. 4 mm long, c. 2 mm wide.

*Selected specimens examined (of eight collections)*: WESTERN AUSTRALIA; KIMBERLEY REGION: E side of Mindjau Ck, Port Warrender, Admiralty Gulf, 14°40'S 125°56'E, *K.F. Keneally* 7763, 16.i.1982 (CANB, PERTH); along Mitchell R. S of Mitchell Plateau [14°47'S 125°44'E], *P.A. Fryxell, L.A. Craven and J. McD.Stewart* 4735, 10.vi.1985 (CANB, MEL, PERTH); 6 km W of Mitchell R. Falls, 14°49'20"S 125°38'30"E, *I. Cowie* 4346 and *C. Brubaker*, 29.iv.1993 (CANB, PERTH); Mitchell R. Falls, Mitchell Plateau, N Kimberley, 14°49'20"S 125°41'40"E, *K.F. Keneally* 7903, 22.i.1982 (CANB, PERTH); Mitchell R., 14°50'S 125°42'E, *C.R. Dunlop* 5262, 22.ii.1980 (CANB, DNA, NSW, PERTH); Porosus Ck above confluence of fresh and salt water, Hunter R., 14°57'S 125°24'E, *K.F. Keneally* 11191, 2.vi.1992 (PERTH); 300 m upstream of junction of tidal and fresh water interface, 14°59'09"S 125°29'14"E, *A.A. Mitchell and T. Willing* 2418, 10.iv.1992 (PERTH).

*Notes*: As noted by Wheeler (1992) and Duretto (1997) the collections from Port Warrender have smaller sepals and narrower leaflets than typical *B. filicifolia* and require further investigation. *Boronia filicifolia* differs from *B. minutipinna* by larger and more numerous leaflets, longer anthopodia and fewer hairs on the abaxial leaf-surface; from *B. kalumburuensis* by leaves with a larger number of leaflets and glabrous to glabrescent cocci; and from *B. pauciflora* by having leaves with more than five leaflets.

*Distribution and ecology*: *Boronia filicifolia* occurs in the catchment area of the Mitchell River, and in the Port Warrender area, western Kimberley Region, Western



Australia (Fig. 18). It is found in heath and open woodland on sandstones and quartzites. Flowering: January-June; fruiting: June-July.

*Conservation status:* 2R (Duretto 1997).

63. *Boronia minutipinna* Duretto, *Nuytsia* 11: 335 (1997), figs 10 T-X. *Type:* Osmond Plateau, WA, 17°16'S 128°22'E, *J. Cowie* 1991, 19.vii.1991 (holotype CANB 412831; isotypes DNA 59392, MEL 229246, PERTH 1881515).

Erect, much branched shrub to 50 cm high. Multiangular stellate hairs with 6–15 rays; rays 0.1–0.25(–0.5) mm long. Branches slightly quadrangular, becoming terete as they age, with a moderately dense to dense stellate indumentum, becoming glabrous as they age. Leaves sessile, 5–34 mm long, 2–4 mm wide in outline, with 17–35 leaflets, leaflets number gradually increasing along axillary branches, the younger distal leaves not becoming unifoliate; rachis segments winged, elliptical, 0.5–12 mm long, 0.5–1.5 mm wide; leaflets with a petiolule c. 0.5 mm long, acute, adaxial surface with a moderately dense stellate indumentum, abaxial surface with a moderately dense to dense stellate indumentum; terminal leaflet lanceolate to elliptic, longer than but the same width as laterals, 1–2 mm long, midvein straight, 0.5–1.5 mm wide; lateral leaflets rhombic, overlapping, 0.5–1.5 mm long, 0.5–1.5 mm wide. Inflorescence 1-flowered, with a moderately dense stellate indumentum; anthopodium 1–6 mm long. Sepals white to pink, longer and wider than petals, deltate, acute, 3–4 mm long, 1.5–2 mm wide, enlarging to 3.5–5 mm long as fruit matures; adaxial surface with a sparse simple and stellate indumentum; abaxial surface with a sparse stellate indumentum. Petals white to pink, 2.5–3 mm long, 1–1.5 mm wide, enlarging to 4–4.5 mm long as fruit matures; adaxial surface with a moderately dense to dense stellate indumentum, becoming glabrous towards base; abaxial surface with a sparse to moderately dense stellate indumentum. Filaments bearing stiff bifid or stellate hairs below glandular tip; antesealous filaments 1.5–2 mm long, prominently glandular on the distal 0.5 mm; antepetalous filaments c. 1 mm long; abaxial surface of anther not frosty; anther-apiculum minute or large and erect, glabrous. Style glabrous or hirsute at base. Cocci (mature not seen) c. 6 mm long, c. 2.5 mm wide, with a moderately dense stellate and simple indumentum. Seed not seen.

*Specimen seen:* Known from the type material only.

*Notes:* *Boronia minutipinna* differs from *B. filicifolia* by its smaller and fewer leaflets that have a moderately dense to dense indumentum on the abaxial surface, smaller anthopodia (5–6 mm long), and perianth parts with a sparse indumentum.

*Distribution and ecology:* *Boronia minutipinna* has been collected once on the Osmond Plateau, south-east Kimberley Region, Western Australia (Fig. 18). It was found growing in sand amongst boulders (collectors' notes). Flowering and fruiting material was collected in July.

*Conservation status:* 1K (Duretto 1997).

### Nomen dubium

*Boronia ledifolia* var. *denticulata* F. Muell. ex C. Moore & Betche, *Handbook Flora New South Wales*: 41 (1893). *Type citation:* "Calgoa, Hickey" (syntype MEL?, *n.v.*). *nomen dubium*

*Boronia ledifolia* var. *denticulata* was published by Moore and Betche (1893) who cite the locality 'Cobar' (which is located at 28°33'S 151°59'E, NSW) but no collector. Maiden and Betche (1916) cite two references for this taxon in their New South Wales census: Mueller, 1890, p. 16; and Moore and Betche, 1893, p. 41. Mueller (1890) does not describe *B. ledifolia* var. *denticulata* but lists three specimens of *B. ledifolia* that had come to his attention:



“*B. ledifolia*, Clyde (Baeuerlen), the variety *Triphylla*; Culgoa (Hickey), a var. with somewhat denticulated leaflets; Cobar (H. Andrae).”

From the above references a number of important points can be made: firstly, it would appear that the correct authority for *B. ledifolia* var. *denticulata* is F. Muell. ex C. Moore & Betehe (Cheel, 1928, p. 411, says that Moore and Betehe implied the taxon from Mueller); secondly, it is not the Cobar specimen that has denticulate leaflets, but the Hickey collection from Culgoa; and thirdly, Mueller says that the Culgoa specimen has leaflets.

Maiden and Betehe (1916) state that specimens of *B. ledifolia* var. *denticulata* were in Mueller's Herbarium (MEL). It is conceivable that Moore and Betehe did not actually see these specimens, but described this taxon to complete their Handbook. A Cobar specimen has been located at MEL (Cobar, Lachlan River, Hans Andrae) that has simple leaves with smooth margins. This specimen can be assigned to *B. glabra*, or more accurately to the hirsute ‘Pilliga’ form of *B. glabra* (see above).

Culgoa (northern NSW) is far removed from areas where members of *Boronia* sect. *Valvatae* have been collected. The closest collections to this area can be assigned to *B. glabra* and are c. 60 or 70 km to the east. *Boronia glabra* has smooth margins. No Culgoa collections by Hickey (or anyone else) have been located in the holdings of *Boronia* at MEL. Edwin Hickey is known to have collected in the Maryland/Stanthorpe area on the NSW/Queensland border (card catalogue of collectors, MEL). Cheel (1928) suspected that *B. ledifolia* var. *denticulata* was a form of *B. repanda*. There are collections of *B. repanda* by Hickey at MEL but this species has simple leaves with glandular margins (see above). As it is not known which specimens, if any, *B. ledifolia* var. *denticulata* was based on, the name would best be treated as a *nomen dubium*.

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**New names published herein:**

*Boronia* sect. *Alatae* Duretto

*Boronia* sect. *Algidae* Duretto

*Boronia* sect. *Valvatae* subsect. *Bowmaniae* Duretto

*Boronia* sect. *Valvatae* subsect. *Grandisepalae* Duretto

*Boronia* sect. *Valvatae* subsect. *Grandisepalae* ser. *Quadrilatae* Duretto

*Boronia* sect. *Valvatae* subsect. *Grandisepalae* ser. *Grandisepalae* subser. *Verecundae* Duretto

*Boronia* sect. *Valvatae* subsect. *Grandisepalae* ser. *Lanuginosae* Duretto

*Boronia* sect. *Valvatae* subsect. *Grandisepalae* ser. *Lanuginosae* Duretto subser. *Jucundae* Duretto

*Boronia* sect. *Valvatae* subsect. *Grandisepalae* ser. *Lanuginosae* Duretto subser. *Filicifoliae* Duretto

*Boronia* sect. *Valvatae* subsect. *Ternatae* Duretto

*Boronia* sect. *Valvatae* subsect. *Ternatae* ser. *Ericifoliae* Duretto

*Boronia* sect. *Valvatae* subsect. *Valvatae* ser. *Erianthae* Duretto

*Boronia* sect. *Valvatae* subsect. *Valvatae* ser. *Fraseriae* Duretto

*Boronia* sect. *Valvatae* subsect. *Valvatae* ser. *Rupicolae* Duretto

*Boronia angustisepala* Duretto

*Boronia anomala* Duretto

*Boronia ternata* var. *promiscua* Duretto

*Boronia ternata* var. *austrofoliosa* Duretto



**Table 1.** Infrageneric classification of *Boronia* section *Valvatae* *sensu lato* in phyletic sequence (except taxa of subsection *Valvatae*). Numbering corresponds to taxa numbering in text. Authorities of all taxa given in text.

Section 1. *Alatae*

1. *B. alata*

Section 2. *Algidae*

2. *B. algida*, 3. *B. edwardsii*, 4. *B. corynophylla*

Section 3. *Valvatae*

5. *B. anomala* subsect. *incertae sedis*

Subsection 1. *Ternatae*

Series 1. *Ternatae*

6. *B. ternata*, 7. *B. adamsiana*

Series 2. *Ericifoliae*

8. *B. ericifolia*, 9. *B. revoluta*

Subsection 2. *Bowmaniae*

10. *B. bowmanii*, 11. *B. squamipetala*

Subsection 3. *Valvatae*

Series 1. *Erianthae* (*sedis mutabilis*)

12. *B. rubiginosa*, 13. *B. eriantha*, 14. *B. warrumbunglensis*,  
15. *B. aff. granitica* (Bolivia Hill), 16. *B. granitica*,  
17. *B. repanda*

Series 2. *Fraseriae* (*sedis mutabilis*)

18. *B. fraseri*, 19. *B. keysii*

Series 3. *Rupicolae* (*sedis mutabilis*)

20. *B. rupicola*

Series 4. *Valvatae* (*sedis mutabilis*)

21. *B. ledifolia* sp. group *incertae sedis*

22. *B. chartacea* sp. group *insertae sedis*

The *B. alulata* species group (*sedis mutabilis*)

23. *B. angustisepala*, 24. *B. umbellata*, 25. *B. mollis*,  
26. *B. amabilis*, 27. *B. obovata*, 28. *B. alulata*, 29.  
*B. quinkanensis*, 30. *B. hoipolloi*

The *B. lanceolata* species group (*sedis mutabilis*)

31. *B. duiganiae*, 32. *B. odorata*, 33. *B. lanceolata*

The *B. rosmarinifolia* species group (*sedis mutabilis*)

34. *B. rosmarinifolia*, 35. *B. splendida*, 36. *B. palasepala*,  
37. *B. forsteri*, 38. *B. glabra*

The *B. foetida* species group (*sedis mutabilis*)

39. *B. jensziae*, 40. *B. excelsa*, 41. *B. foetida*, 42. *B. bella*

Subsection 4. *Grandisepalae*

Series 1. *Quadrilatae*

43. *B. quadrilata*, 44. *B. viridiflora*

Series 2. *Grandisepalae*

Subseries 1. *Verecundae*

45. *B. verecunda*, 46. *B. xanthastrum*

Subseries 2. *Grandisepalae*

47. *B. suberosa*, 48. *B. grandisepala*, 49. *B. laxa*,  
50. *B. aff. laxa* 1, 51. *B. aff. laxa* 2, 52. *B. prolixa*,  
53. *B. aff. prolixa*, 54. *B. amplexens*

Series 3. *Lanuginosae*

Subseries 1. *Lanuginosae*

55. *B. lanuginosa*, 56. *B. wilsonii*

Subseries 2. *Jucundae*

57. *B. decumbens*, 58. *B. tolerans*, 59. *B. jucunda*

Subseries 3. *Filicifoliae*

60. *B. pauciflora*, 61. *B. kalumburensis*, 62. *B. minutipinna*,  
63. *B. filicifolia*

**Appendix 1.** Voucher specimens for leaf anatomical data. Principle collector given only. All vouchers logged at MEL unless otherwise stated. An ‘\*’ indicates that material was removed from a herbarium sheet and rehydrated. All other material was removed from pickled collections.

- B. adamsiana* (Duretto 172, Smith 597 [MEL 678905]\*)  
*B. alata* (Duretto 247)  
*B. algida* (Duretto 7)  
*B. alulata* (Duretto 395, 399)  
*B. amabilis* (Duretto 58, 353)  
*B. angustisepala* (Williams, 8.x.1988 [NSW 238425]\*)  
*B. anomala* (Harwood 169 [MEL 2044558]\*)  
*B. bella* (Duretto 269)  
*B. bowmanii* (Duretto 400)  
*B. chartacea* (Duretto 107)  
*B. decumbens* (Duretto 474, 548b, Clark 835 [DNA 9000121]\*)  
*B. duiganiae* (Duretto 320)  
*B. edwardsii* (Duretto 125)  
*B. ericifolia* (Duretto 154)  
*B. eriantha* (Duretto 369)  
*B. excelsa* (Forster 17248)  
*B. filicifolia* (Fryxell 4735 [CANB 377231]\*)  
*B. foetida* (Duretto 263)  
*B. forsteri* (Forster 11429)  
*B. fraseri* (Blakely & Shiress, x.1924 MELU\*)  
*B. glabra* (Duretto 79, 330, 331)  
*B. grandisepala* subsp. *acanthophida* (Duretto 459)  
*B. grandisepala* subsp. *grandisepala* (Duretto 483, 527, Chappill 4756, Russell-Smith 7478 [DNA 48654]\*)  
*B. granitica* (Duretto 350)  
*B. hoipolloi* (Clarkson 10473)  
*B. jensziae* (Duretto 409)  
*B. jucunda* (Duretto 509, Chesterfield 214 [MEL 1534494]\*)  
*B. kalumburuensis* (Edwards 9247 [CANB 463023]\*)  
*B. keysii* (Duretto 369)  
*B. lanceolata* (Duretto 533, Chappill 4835)  
*B. lanuginosa* (Duretto 424, 441, 445, 448, 454, 479, 480, 491, 500, 501, 503, 504, Dunlop 8216 [DNA 42766]\*)  
*B. laxa* (Duretto 445)  
*B. ledifolia* (Carpenter 1005, Duretto 87)  
*B. minutipinna* (Cowie 1911 [MEL 229246]\*)  
*B. mollis* (Duretto 62)  
*B. obovata* (Duretto 301, 302)  
*B. odorata* (Duretto 282, 289)  
*B. palasepala* (Duretto 279)  
*B. pauciflora* (Byrnes 2260 [DNA 3625]\*, Craven 9212 [CANB 46113]\*)  
*B. proluxa* (Craven 5957 [CANB 313892]\*, Russell-Smith 1098 [DNA 23816]\*)  
*B. aff. proluxa* (Hartley 13722 [CANB 245049]\*)  
*B. quadrilata* (Brennan 1567\*)  
*B. quinkanensis* (Duretto 385, Clarkson 9619)  
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